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THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED

THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER:

ELECTRO-PLATERS REVIEW

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LABOR "FEASTS AND FAMINES"

THE RESULTS OF OBSERVATIONS OF BUSINESS CONDITIONS FOR THE PAST TWENTY-FIVE YEARS.

WRITTEN FOR THE METAL INDUSTRY BY WILLIAM F. HIRSCHMANN.

During the last twenty-five years the country has passed through five or six business feasts and famines. Through personal experience and observation, the writer has noted the same procedure in almost all lines of machine manufacture throughout these periods. That is to say, when business is rushing, men will be put to work on machines which will perhaps produce only 25 per cent of *their* capacity, because of the inefficiency of the operator, while the factory as a whole will be only 50, 55, or 60 per cent efficient when crowded to *its* utmost capacity. When business is poor, this percentage of efficiency usually climbs up to 85 or 90 per cent. The reason is that, as a matter of course, the best men are retained as long as possible.

To develop and educate a competent and reliable mechanical force, 90 per cent efficient, requires about two years' time, and often at the point where this development has been reached the usual slump in business takes place. The customary layoff follows, which scatters the greater part of this human machine to the four winds. Within a year the manager will again go through the routine of hiring, and firing, and swearing at the inefficiency of help, until he has rebuilt his working force. But in the meantime what has been profited from past experience? What has been done to retain that human efficiency which has cost so much toil and worry to develop, not counting the dollars? Who is to blame? Is it the workman? Is it the manufacturer? Why does a manufacturer pay in rush times 50 to 60 cents an hour for labor 40 to 50 per cent efficient, when he could, by retaining his experienced help during slack times, stock up with labor at 40 to 50 cents an hour and 80 to 90 per cent efficient? What can be done to equalize this proverbial "feast or famine" condition in the skilled labor ranks?

In every annual business report, a certain amount is written off for depreciation. Has it ever occurred to any manufacturer that it might be good policy to set aside some amount yearly for "appreciation"—appreciation in the value of the working force he has developed—his human machinery—the most valuable asset he possesses, if he only realized it? How many firms endeavor to keep this human machine intact when slack times come? Very few, which is natural, perhaps under existing conditions, for it takes courage to pay wages when business is poor and insufficient.

One of our most able financial writers, Mr. B. C. Forbes, several years ago advised the big corporations of the country to retain part of their surplus profits, to be paid out as dividends in those lean years when dividends would not be fully earned. An excellent idea which is, no doubt, being followed out, if we are to judge by the surpluses being piled up by many large concerns, notably the steel and copper companies, notwithstanding war taxes. Would it not be a good idea for the maker of staple articles to set aside 5 or 10 per cent of his profits in boom years for "appreciation" and thereby create a fund in prosperous times that would enable him to carry over his employes through the period of depression, by making up a stock of those articles which are sure to be sold when business revives, and, if possible, make things into which would enter the maximum of labor with the minimum of material?

Mr. Henry Ford has been called a great philanthropist because he pays the highest wages in the country. He may be, but an analysis will prove that his cost *per unit* is the lowest in his particular line, in spite of high wages. He has discovered the value of the human element and has capitalized it into an immense fortune, while at the same time he benefits all those who work for him. He has proved the mechanical paradox, that the highest-priced mechanic is the cheapest when he can measure up to his price.

What thought is given to the "undesirable citizens" created by these periods of enforced idleness? How many men "go to the dogs" because the "devil always finds something for idle hands to do"? How many men would settle down to useful lives and become good husbands and fathers if only assured of steady work, year in and year out? It is hardly possible to keep business always on the same level, but could it not be made more uniform than we have had it? Why do we pay 100 to 200 per cent excess cost per unit in rush times? Because it is not considered "good business" to tie your money up in stock? Let us see.

In round figures, the interest on a million dollars' worth of stock carried for two years would be $120,000. Let us say that in good times a factory employs 500 hands, 90 per cent efficient, at $3.50 per day. A slump in business occurs, and by degrees the force is decreased to 200, sufficient to do the decreased business and no more. This condition continues for a year, and then comes the rush. Every customer wants his order at once. To meet the demand, anyone and everyone is hired and put to work until after a time, with much trouble, about 750 men, 60 per cent efficient, are employed to create the output that the 500 men of the old force would have supplied. Under such conditions wages always rise, and the average we will say is $4.25 per day istead of $3.50. Three-fifty multiplied by 500 equals $1,750. Four dollars and twenty-five cents multiplied by 750 equal $3,187.50.

This is $1,437.50 excess wages daily to secure the same amount of production. In 84 days the $120,000 has been paid out in excess wages from which the workman derives no benefit, because automatically with his increase of wages the purchasing power of his dollar shrinks, while the manufacturer, who cannot always increase his prices arbitrarily, must usually pay more for his raw material because he wants spot deliveries, whereas had his working force been kept intact while piling up stock he would have the stock to draw on. The advantages derived from low cost of material and production, with an increased selling price, are very important items in the matter of dividends.

These figures do not include overtime wages, usually 50 per cent additional, nor take into consideration overhead charges, which increase in an inverse ratio to the efficiency of the men.

This problem is one of the most vital in connection with the labor question of to-day. The man or the organization that can bring about its solution will be a benefactor of modern industry.

The subjects touched upon in this article are not new, and the writer does not assume that the conditions described are universal. It is a view of conditions taken from a personal angle of observation and the views and ideas advanced with one exception have been threshed out many times in writings and discussions, without being remedied. The only idea that the writer has never seen advanced either in print or discussion is the one of "appreciation." It may be a new one but is given any way.

SAFETY FIRST. IT IS NECESSARY FOR BOTH OPERATORS TO PUSH THE PEDAL BEFORE THE SHEAR WILL WORK.
From a Bulletin of the National Safety Council.

ELECTRO-DEPOSITION OF IRON

There are many formulae in existence for deposition of iron but all of them give some trouble. The anodes should always be in excess of the cathode surface, so that the acidity of the solution will not develop too rapidly under the influence of electrolysis. The voltage should not exceed 2 and the amperage from 5 to 8 per equare foot of surface.

We give below three types of solutions from which can be determined which solution gives the best results. In all three solutions anodes of soft sheet steel not less than 1/16 inch thick should be used.

1.

Water	1 gallon
Ferrous sulphate	1 pound
Ammonium chloride	¾ pound
Magnesium sulphate	4 ounces

2.

Water	1 gallon
Ferrous ammonium sulphate	1½ pounds
Magnesium sulphate	4 ounces

3.

Water	1 gallon
Ferrous sulphate	1 pound
Magnesium sulphate	1 "

If the solutions are radically acid add very small proportions of magnesium carbonate and carbonate of iron to neutralize the excess of acid.—C. H. P.

ALUMINUM: ITS USE IN THE MOTOR INDUSTRY IN ENGLAND

An Article Dealing With the Application of the Metal in Replacing Steel and Other Metals.

By E. Carey Hill, M.Inst.Met. (Technical Director of Rowland Hill & Sons, Ltd., Aluminum Foundry.

INTRODUCTION.

The widespread use of aluminum in petrol engine and motor-car construction which now prevails makes it deserving of more special study than it has hitherto, at any rate until quite recently, received. This perhaps is not so surprising when we remember that it was only first separated as a metal from its ore in 1827, while it was not until 1854 that it was obtained in a perfectly pure condition. Even then it was some years before its possibilities began to be fully realized; and the very rapid development of the motor industry has increased its commercial importance perhaps faster than science has developed and made known its peculiarities.

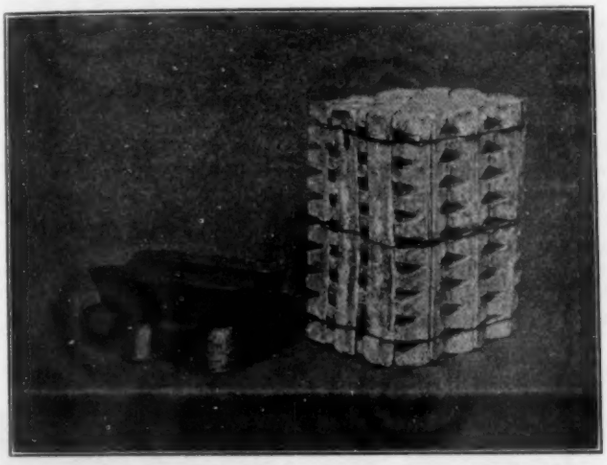


FIG. 1.—A HUNDRED POUNDS OF COPPER COMPARED WITH THE SAME WEIGHT OF ALUMINUM.

During the years 1906 to 1912, however, a vast amount of scientific research was conducted, and some of the results are embodied in the eighth, ninth, and tenth reports to the Alloys Research Committee of the Institution of Mechanical Engineers; and further investigation has been taking place since then, the result of which will, no doubt, in due course, help to place our general knowledge on the subject of the ternary alloys of aluminum on a more precise foundation.

It is my intention to deal with the metal from the point of view of the aluminum founder in connection with the motor car and aircraft industries.

Owing to the war, a large amount of experimental work has taken place during the last two years, which, being principally in Government interests and for war purposes, it is not permissible to publish. I must, therefore, ask your indulgence if I appear reticent on matters which may be of interest.

PHYSICAL PROPERTIES.

The most outstanding property of aluminum is, of course, its lightness. The specific gravity of the pure metal when cast is 2.56, but slightly above one-third that of iron. When rolled or drawn, the specific gravity is 2.71 (copper 8.95). The specific heat is 0.212. The melting point is 1,210 deg. F. or 654 deg. C. The peculiar whiteness of the metal is very striking. It has very high malleability and considerable ductility. Its tensile strength in the pure state is from 7 to 8½ tons per square inch; it is too soft, however, to be used in engineering design unalloyed, but when alloyed, this softness is corrected, and the tenacity considerably increased. It does not corrode at all readily in the pure state, and even when alloyed, a dry atmosphere has practically no effect upon it. Its contraction during cooling is somewhat high, about 3/16 inch to the foot, and this property calls for very careful treatment in the foundry for the successful production of castings.

USES.

As I have said, the principal purpose, at any rate, the purpose which interests us most, to which the metal is put, is in the construction of petrol engines for aeroplanes and motor cars, and in housings and casings for the transmission gearing of motor cars, also in tanks and frames for radiators for water cooling on petrol engines, and in numerous smaller parts of planes and cars, such as number plates, handles, brackets, footboards, pipes, etc. In the rolled sheet form it is also used for body construction, in which its lightness renders it very valuable, also for windscreens and casings on aeroplanes. Apart from the motor industry, however, it has come to be extensively used in railway carriage construction and internal fittings; in cooking utensils both for household purposes and more especially for manufacturing purposes, such as vats, varnish pots, stills, cookers, storage tanks, etc. It has a very large field in the electric world, where it has already been adopted to replace copper in large insulated cables for power transmission; its electric conductivity is only 58.5, as compared with copper 97.5, but as its weight is less than one-third that of copper volume for volume, this is no detriment. It is also used in the rubber industry, where its resistance to the action of sulphurous fumes makes it very valuable; it is used in collecting cups on the rubber estates, and in mandrels in the manufacture of inner tubes and outer covers of motor tires. Considerable saving in weight and wear on bearings

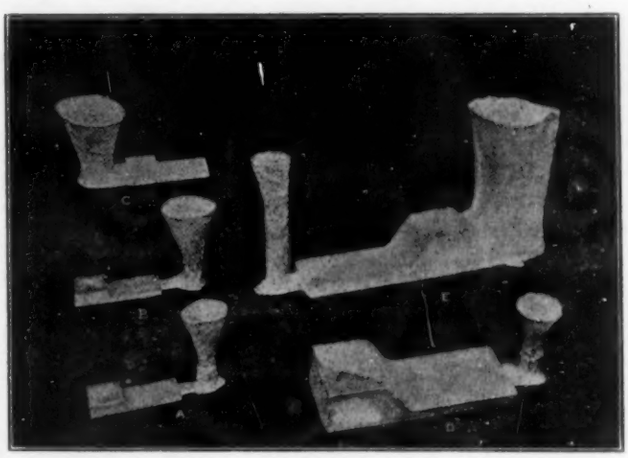


FIG. 2.—ILLUSTRATES THE DEFECTS CAUSED BY CONTRACTION, AND HOW THEY CAN BE REMEDIED BY PROPERLY PLACED RISERS OR FEEDERS.

A, Casting with two widely different thicknesses incorrectly run. B, An attempt to remedy by placing a chill on the thick part, only slightly improved. C, Correctly run; note that the thick part is in this case true to shape of pattern. D, A large casting incorrectly run; note porosity and drawn place. E, Correctly run and fed; note the very heavy feeder necessary to produce solidity.

is made by its use for cast pulleys, on line shaftings for power transmission, and in machines with reciprocating parts, such as planers. It is also used for cycle mudguards and rims, and has even been tried for the frames, though, I believe, not with great success, owing to the difficulty of jointing at the lugs, no really satisfactory method of soldering aluminum having been yet discovered.

PRACTICE IN THE FOUNDRY.

Treatment of aluminum in the foundry, for the production of sound castings, has now reached a stage of considerable perfection. Experience has taught us that certain principles must be adhered to, if good results are to be systematically maintained. The facts which govern these principles are: (1) The high contraction of aluminum during cooling; (2) the peculiar stage of plasticity through which it passes between liquid and solid, similar to common solder; (3) its very low tenacity at high temperatures.

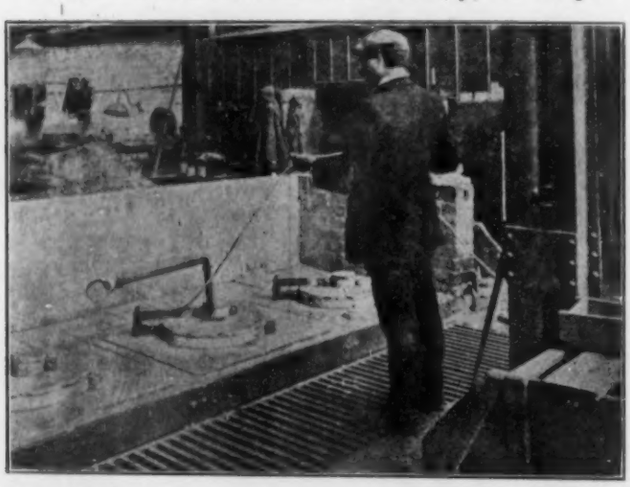


FIG. 9.—READING THE TEMPERATURE OF THE ALLOY WHILE IN THE FURNACE. THE INDICATOR IS IN AN ADJOINING OFFICE.

Although these peculiarities vary slightly in the different alloys, nevertheless, the principles I speak of may generally be applied to all light aluminum alloys in sand-casting.

Now castings are required for structures of intricate design, in which the thicknesses vary in different parts of the design, due to the provision of bosses, bearing housings, flanges, facings, etc. This at once introduces complications during the cooling processes after the casting is poured, and I will endeavor to follow these processes and explain the best methods of preventing any ill results occurring.

I have mentioned the plasticity of aluminum alloys during solidification. Now, if we take as example a simple form in which are two thicknesses, it is clear that owing to its smaller mass and greater relative area for radiation, the thin portion of the casting will have completely solidified, while the thicker portion is still plastic; consequently, contraction will have commenced in the thin portion, which may thus exercise considerable stress on the junction of the thin and thick portions; the latter, having at this stage not yet acquired any tenacity, is unable to resist the stress, and in its plastic state is pulled partly asunder at the junction; the result, after complete solidification, has a curious opened-out, spongy appearance, and is generally called a draw. This may be prevented by placing a chill in the mould on the face of the thick portion, so that cooling is accelerated locally and solidification is simultaneous in both portions.

Now, if we consider a more aggravated instance in which the thick portion is much heavier, and in which the metal is run through the thin part, we shall find that the thick part fails to keep up to shape owing to contraction, as well as a very open spongy surface becoming apparent.

It is clear that some compensation must be arranged for the shrinkage during cooling, if a casting true to pattern is to be produced. This is provided by the addition of what are commonly called feeders or risers. The action being that the mass of the feeder being greater than the mass of the thick part to which it is attached, it will remain liquid longer, and as the casting skin solidifies and thickens, the heart, still liquid, will be supplied from the feeder, thus preventing the effects of shrinkage from deforming the skin or shell which solidified first. A draw will become apparent in the feeder, if carefully examined, where, however, it does no harm. It must be carefully noted that unless the feeder is of very ample dimensions, and exceeds in mass the portion of the casting to be fed, then the feeder will solidify first and will draw its supply of metal from the casting, thus making matters worse than before. This error is often committed by the moulder, who is sometimes apt to attribute virtue to a feeder irrespective of its size in relation to the casting it is designed to feed.

It may perhaps be said that these are simple and elementary principles of founding, which apply to many other metals besides aluminum, and, to some extent, this is true, but the peculiarities of aluminum to which I have referred are so accentuated that it would be difficult to over-emphasize the importance of great care in applying these principles in the production of castings in this metal. The next point to which I especially wish to call attention is the temperature at which the metal is dealt with.

READING THE TEMPERATURE OF THE ALLOY AT THE MOMENT OF POURING THE METAL INTO THE SAND MOULD.

Pure aluminum melts at a temperature of about 654 deg. to 660 deg. C. Practically all the alloys commonly used, that is, alloys rich in aluminum, melt at still lower temperatures. For example, an alloy containing 10 per cent. copper melts at about 630 deg. C.; an alloy containing 20 per cent. zinc melts at about 620 deg. C. Consequently, there is no need to raise the temperature of the metal at all high, probably not above 700 deg. C. to 720 deg. C., for the purpose of

the production of sand castings of any nature. Now, it has been proved that the physical properties of the resultant castings are very greatly influenced by the temperature to which the metal has been raised in the furnace, and still more perhaps by the temperature at which the casting is poured. Excessive heating in the furnace produces oxides, the presence of which reduces the tenacity of the casting, and has a generally bad influence on the behavior of the metal, encouraging drawn places and cracks during cooling. It is found also that the best results as regards physical tests cannot be obtained unless the pouring temperature is carefully watched and kept as low as possible. It is, of course, impossible, owing to the variety of alloys used, to specify any temperature which should be adhered to, but it should be remembered that the lowest possible temperature for casting should always be adopted which is consistent with sufficient fluidity to run the particular casting in question, and, at the same time, to allow any air bubbles which may be formed during pouring to escape from the metal before it solidifies.

It will probably be found that a temperature of from 680 deg. C. to 700 deg. C. will give satisfactory results for general foundry work with normal alloys containing about 85 to 90 per cent. of aluminum. In this connection it will perhaps be of interest later to refer to the liquidus curves of the alloys of aluminum with copper and with zinc. These curves give one immediately an idea of the melting points of these two series of binary alloys, and help to indicate what is likely to be a suitable temperature for foundry working.

A point for very careful supervision in the foundry is the manner of making the cores for cored castings, and the material used for them. Wherever possible, it is desirable to use green sand cores, which will offer less resistance to the contraction of the casting, and great care should be used to ensure that they are as soft as is consistent with satisfactory working. In many cases, however, dry sand cores have to be resorted to, and then a sand mixing should be used which will give the largest degree of collapsibility to the core after the casting is made.

I have always found that better results are obtained, especially in large casting with complicated coring, when the runner is placed on a level with the bottom of the mould and the metal poured in; thus steadily rises, and pushes the air before it upwards through the risers. The alternative entails the rapid descent of the metal through the mould to the bottom, which gives greater risk of the displacement of cores, and causes a certain amount of air to become mixed up with the metal, and, consequently, increased risk of blow holes.

With regard to the melting and mixing of alloys, it is the general practice where copper is to be included to first make a preliminary alloy containing 50 per cent. copper and 50 per cent. aluminum, by first melting the copper and then adding the aluminum piece by piece. I have seen it suggested that a better method is to make the composition of this preliminary alloy that of the eutectic, that is, 33 per cent. copper and 67 per cent. aluminum, but I have not tried it, and do not see exactly what advantage would be gained by doing so. The 50:50 alloy melts at a low temperature, about 580 deg. C., and consequently at a much lower temperature than pure aluminum, and can, therefore, be conveniently added to the charge of metal in the furnace in suitable quantities, without any excessive heating at all being required. It also has the great advantage that it is exceedingly brittle, so much so that an ingot will break if dropped on a hard floor; it can, therefore, be easily broken up into small pieces so that the exact weight required for each charge is readily prepared. When zinc is to be included in the alloy, it should be added at the last, when the rest of the charge has reached the temperature required. Great care is needed to ensure that all the zinc is melted and thoroughly stirred, so that even alloying results, otherwise the metal at the bottom of the crucible will be found to be rich in zinc.

The temperature which I have already mentioned as suitable for the maximum of the metal in the furnace, viz., 720 deg. C., can be approximately gauged, after experience, with the naked eye, by the amount of red light given out; at a temperature of 670 deg. C. there is almost no light given out in daylight, the metal reflecting its natural silvery white lustre; but to see this truly, it is necessary to push aside the film of oxide which forms on the surface, and which, at this temperature, is itself variously colored, according to the composition of the alloy, and is, consequently, liable to cause an error. I do not suggest, however, that such crude methods should be relied upon, as the importance of the pouring temperature, especially for castings whose physical properties must attain fixed standards, necessitates the continual use of instruments of scientific precision for temperature measurement. The pyrometer used for this purpose has not to stand any temperatures above, say, 900 deg. C., and it is consequently possible to use a thermo-couple of common metals, such as iron and constantan, the latter being an alloy of copper and nickel. These being comparatively inexpensive may be renewed whenever deterioration necessitates it. It is better, even so, to have the thermo-couple well protected by a steel tube, as workmen hesitate to use freely an instrument which is easily damaged. This protecting tube may cause an error in reading temperatures of 5 deg. or 10 deg. C., due to the increased time taken for the thermo-couple to assume the temperature of the metal; but this error may be found by experiment and allowed for, and the result thus obtained will be quite sufficiently accurate for foundry purposes. It is well to test the accuracy of the pyrometer at fairly frequent intervals. One simple method of doing this is to take a cooling curve of tin, that is by allowing the instrument to stand in some molten tin, and record the temperature at frequent intervals of, say, every half-minute; the break in the otherwise continuous downward curve which occurs during the period of solidification will be indicated, and should occur at 228 deg. C., the melting point of tin.

The melting of aluminum alloys has been practised in nearly every type of furnace. I have myself found that a furnace in which the fuel is compressed gas mixed at the jet with atmospheric air gives very good results. Furnaces are also used burning low-pressure gas with compressed air, and others burning oil with compressed air. Sometimes the old fashioned pit type of crucible furnace burning coke is still used, and with furnaces properly designed can give very economical results. The crucibles used in all the above types of furnace are plumbago, and, generally speaking, give the best results. The alternative, the iron crucible, is, however, being used with some success, but the risk of iron being taken up in the aluminum alloy must be taken into account. Special iron crucibles which are professed to evade this possibility are on the market.

THE ALLOYS OF ALUMINUM WITH COPPER.

This series of alloys are of particular interest, because, at both ends of the series, that is, the alloys rich

in copper and the alloys rich in aluminum, are found alloys which have properties of great value to the engineer.

Taking first the alloys rich in copper, we find that from .1 to 11.0 per cent. of aluminum, the properties are such as to render the alloys of value.

The most prominent and well-known alloy of this group is that containing 90 per cent. copper and 10 per cent. aluminum, and known as aluminum bronze. It has a specific gravity of 7.57. With from 8 to 10 per cent. aluminum, there is found relatively high tenacity, a fairly distinctive yield point of from 12 to 20 tons

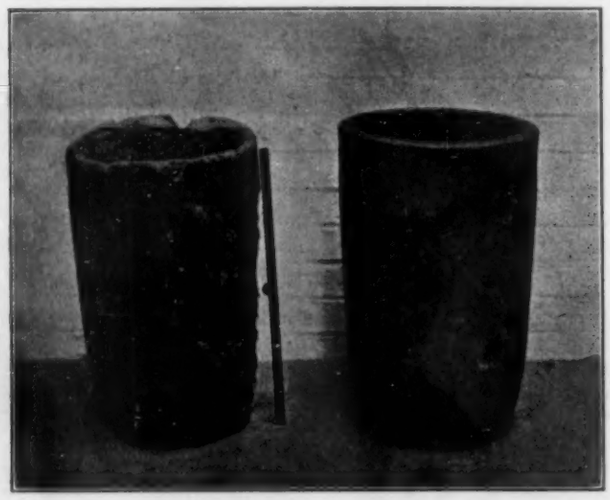


FIG. 5.—TWO PLUMBAGO CRUCIBLES: CAPACITY, 2 CWTS. OF ALUMINUM EACH. (NO. 1 HAS MELTED 105, 2 CWT. CHARGES, NO. 2 IS NEW, HEIGHT 25 INCHES.)

per square inch, and an ultimate or breaking strength of 30 to 35 tons per square inch. In making castings of these alloys, the aluminum may be added direct to the copper, without making a preliminary or intermediate alloy of 50 copper: 50 aluminum. It is important to see that thorough stirring of the mixture is always carried out, and to watch the casting temperature. The contraction varies from 1.83 per cent. to 2.34 per cent.

This group of alloys are nearly incorrodible by sea water, either alone or when attached to steel, and are only slightly corrodible in ordinary fresh water.

The next group of the series, containing from 12 per cent. to 85 per cent. of aluminum, are of little use, being extremely brittle, but it is of interest to note that with 15 per cent. aluminum very great hardness is attained, Brineil No. 539, which is equivalent to the hardness of a steel containing .45 per cent. carbon quenched in water at 20 deg. C.

The final group of the series containing from 1 per cent. to 15 per cent. copper are of great interest. The alloy containing 8 per cent. copper is that which has practically become the standard alloy used in the United States of America for motor car castings. It has a specific gravity of 2.85. Part of this group, from 3¾ per cent. up to 12 per cent. copper have moderate tenacity, giving yield points of from 5 to 7 tons per square inch. and ultimate strength of from 6 to 10 tons per square inch. But by mechanical treatment great improvement may be achieved, rolled bars containing 3.76 per cent. copper have been made to give 18.5 tons yield, 20 tons ultimate, with an elongation of 7.5 per cent.

An alloy containing 10 per cent. copper is much used in this country for castings in which fresh water is to be contained, such as radiator tanks and water pipes, on account of its close grain. Alloys in this group have been hydraulically tested and found to withstand very high pressures indeed most satisfactorily. They are practically uncorroded by fresh water, and this is a property of considerable value; but they are rather strongly corroded by sea water.

It is of great importance in melting any of this group of alloys to avoid any overheating of the metal.

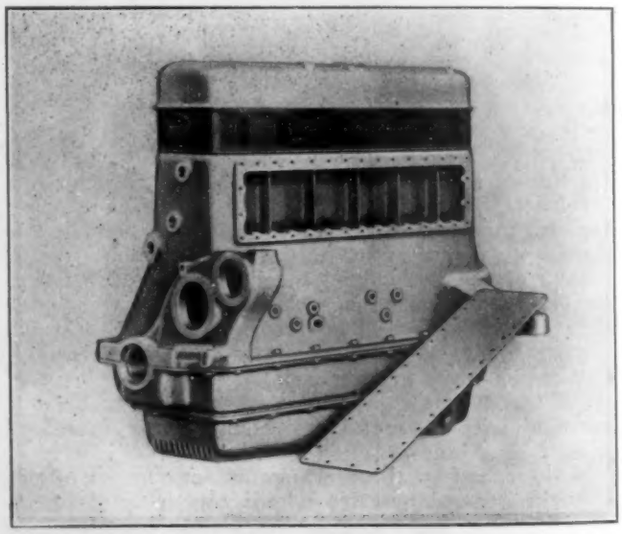
The liquidus curve to which I have already referred, shows that the eutetic alloy, that is, that alloy of the series having the lowest melting point, consists of 67 per cent. aluminum, and 33 per cent, copper, and melts at about 540 deg. C. The temperatures shown on this liquidus curve are the temperatures at which alloys of the pure metals commence to deposit solid crystals; the solidification may not be completed until slightly lower temperatures are reached. In the case of an alloy containing appreciable impurities, the temperature shown would be lowered.

An alloy containing 7 per cent. copper is often used for production of die castings.

ALLOYS OF ALUMINUM AND ZINC.

This series of alloys are of very great value, as they attain considerable tenacity.

In the preparation of the light aluminum zinc alloys, although care must be taken, there is not so much danger of loss of zinc by volatilization as in the preparation of brass, aluminum having a much lower melting point than copper; and if the aluminum is kept at a temperature only slightly above its melting point, and the zinc entirely submerged in the aluminum when alloying, the loss will be surprisingly small.



THE EXTENSIVE USE OF ALUMINUM IS WELL SHOWN BY THE NUMBER OF ENGINE PARTS MADE OF THIS METAL.

The group of the series which is of principal interest is that containing from 1 per cent. to 25 per cent. of zinc.

It has been alleged that these alloys are liable to serious defects, such as corrosion, cracks, and disintegration when aged, but this allegation has not been very materially supported by experiments conducted on alloys made from pure metals, and it is probable that impurities introduced in the zinc have at times been the cause of such defects.

(To be continued)

SOLDERING AND BRAZING

A Practical Article Describing the Various Phases of Operations and Materials Used. Written for The Metal Industry by P. W. Blair, Mechanical Editor.

Solders for joining metallic surfaces or edges are almost invariably composed of an alloy of two or more ingredients or metals. The solder used on different classes of work generally have a lower melting point than the metals to be joined, but the fusing point should approach as nearly as possible that of the metals to be soldered so that a tenacious joint is obtained. Solders may be divided into two general classes—hard and soft. The former fuses at a red heat, the latter at a comparatively low temperature. These solders are also subdivided into a variety of classes such as brass, silver, gold, copper, tin, plumbers' solder, and so forth, the name in most cases designating the application.

Soft solders consist chiefly of lead and tin, although other metals are occasionally added to lower the melting point. Lead-tin alloys melt at a lower temperature with an increase in the percentage of tin up to a certain point, but when the tin exceeds 67 per cent. the melting point rises gradually to the melting point of tin, as shown by the Table No. 1. This table also gives the Brinell hardness test. The results show that the hardest alloy contains 66 per cent. of tin and 34 per cent. of lead. Soft solders are termed "common," "medium" and "fine," according to the tin content and those containing the most are the cheapest and have the highest melting temperatures.

Table No. 1

MELTING TEMPERATURES OF LEAD-TIN ALLOYS

Percentage Tin	Lead	Melting Temp. Deg. F.	Brinell Hardness Test	Percentage Tin	Lead	Melting Temp. Deg. F.	Brinell Hardness Test
0	100	618.8	3.9	60	40	368.6	14.6
10	90	577.4	10.1	66	34	356.0	16.7
20	80	532.4	12.16	70	30	365.0	15.8
30	70	491.0	14.5	80	20	388.4	15.2
40	60	446.0	15.8	90	10	419.0	13.3
50	50	401.0	15.0	100	0	466.0	4.1

Fine solder is largely used for soldering britannia ware, brass and tin-plate articles and is generally composed of not less than 50 per cent. tin, the balance lead with a certain percentage of bismuth which makes it flow freely. It is also used for soldering cast iron, steel, copper and many allows. The soft solder commonly used by plumbers for wiping joints and ordinary work contains two parts of lead to one of tin. The best soft solders are made from pure tin and lead. Antimony is an objectionable impurity, as it renders the solder less fluid when melted and tends to prevent perfect adhesion of the surfaces.

Zinc also has an injurious effect on soft solder causing it to flow sluggishly and coarse texture aluminum acts in about a similar way. A small percentage of phosphorus renders soft solder very active, that is, the solder has a tendency to run freely. Too much phosphorus is injurious and if added to the solder it should be in the form of phosphor tin. One or two ounces of five per cent. phosphor-tin to one hundred pounds of solder is generally sufficient. Hard soldering or brazing is used for joining such metals as copper, silver and gold, and alloys such as brass, nickel, silver, gunmetal, etc., all of which require a strong joint and a solder the color of which is near that of the metal joined. One of the principal varieties of hard solders is really a brass, being composed of copper and zinc in general. The more copper and the less zinc the higher the melting point and the more copper the stronger the joint or resulting alloy. It will be well to consult Table No. 2 for the melting temperatures of copper-zinc alloys.

Table No. 2

MELTING TEMPERATURES OF COPPER-ZINC ALLOYS

Percentage Zinc	Copper	Melting Temp. Deg. F.	Percentage Tin	Lead	Melting Temp. Deg. F.	Brinell Hardness Test
0	100	1980	60	40	368.6	14.6
4	96	1967	66	34	356.0	16.7
14	86	1890	70	30	365.0	15.8
20	80	1846	80	20	388.4	15.2
24	76	1796	90	10	419.0	13.3
18	72	1756	100	0	466.0	4.1

The ordinary hard solder used for miscellaneous purposes is a "half-and-half" mixture. It is very strong and has the moderate temperature of 1,600 degrees Fahr. This corresponds to a dull orange heat. What is termed coppersmiths' strong spelter is a mixture containing 3 parts copper and 1 part zinc. The melting point of this solder is 1,750 degrees Fahr. Ordinary coppersmiths' spelter has 58 per cent. copper and 42 per cent. zinc, so naturally it melts at a much lower temperature—around 1,645 degrees Fahr., or at an orange heat. Of course, if these latter mixtures are used it must not be expected that the same strength as with the 75:25 mixture will be obtained.

There are other hard solders which are only variations from the foregoing brasses. They are made by adding certain other metals in small percentages at the expense of the copper or zinc or both. For example, there is gray solder which is easily melted. It may be made according to the formula copper 44, zinc 50, tin 4, lead 2. This can be regarded as a "half and half" hard solder in which 6 parts of the copper is replaced by lead and tin. In fact, it can be made from "half-and-half" soft solder and "half-and-half" half hard solder. It is also possible to get a great variety of fusion points by mixing various proportions of hard and soft solders.

Hard solders sometimes include such metals as nickel, gold, silver. Thus nickel may be added to a brass and a very hard and strong solder produced. The brass-nickel solders are very useful in soldering nickel, silver and steel surfaces. See table No. 3 for nickel, silver and steel solders.

Table No. 3

COMPOSITION OF BRAZING ALLOYS

Copper	Zinc	Tin	Lead	Characteristics	Color
58	42	..	..	very strong	reddish yellow
53	47	..	..	strong	reddish yellow
48	52	..	..	medium	reddish yellow
54.5	43.5	1.5	0.5	medium	yellow
34	66	..	..	easily fusible	white
44	50	4	1	easily fusible	gray
55	26	15	4	white solder	white

Silver solder is a hard solder containing copper, silver, zinc or brass. The compositions of silver solders vary considerably, according to the nature of the work. A silver solder extensively used by jewelers contains 70 parts silver and 30 parts copper. Silver coins can be used for small work. Silver soldering is employed for uniting comparatively small parts which require a strong and tenacious joint. The heating is usually effected by

a blow pipe and borax or powdered boracic acid may be used as a flux, and which should be applied, if possible, before heating.

A hard solder of low fusing point that is used extensively by one of the largest electrical companies is composed of 34.36 per cent copper, 49.24 per cent silver and 16.40 per cent zinc, borax being used as a flux.

Solders for nickel silver are generally made of the same materials as those which compose the alloy to be soldered, but in such proportions that the melting points are lower. In some cases silver solder is also used for uniting silver articles and nickel silver is used for soldering articles of iron and steel on account of its high melting point and tenacity. Nickel silver solders are known under different names such as "argentan," "arguinoid," etc. They are rendered moderately fusible by an addition of zinc to the copper and nickel. If the solder is too brittle this is an indication of too much zinc, which defect can be remedied by adding the requisite amount of copper and nickel. For soldering alloys composed of from 16 to 22 per cent nickel the following proportions may be used as a solder—copper 47, nickel 11 and zinc 42 per cent.

DIP BRAZING.

The principal difference between dip brazing and ordinary brazing is that with the dip method the work is immersed into the molten spelter until the parts are heated sufficiently to be united by it. This method is extensively used and employed in bicycle manufacture, as it is more economical for duplicate work and can be done by common labor.

FLUXES FOR HARD SOLDERING.

Borax is a favorite flux when hard solders are employed. It may be applied dry or in the form of a paste made up with water. It is recommended that heat-dried borax or calcined borax be used. Table No. 4 gives a list of fluxes used in soft and hard soldering on various metals.

TABLE No. 4

SOFT AND HARD SOLDER FOR VARIOUS METALS

Metal to Be Soldered	Flux	Soft Solder: Tin	Soft Solder: Lead	Other Constituent
Aluminum	Stearin	70	..	Z. N. 25 A. L. 3 P. T. 2
Brass	Chloride of Zinc	63	34	.....
Gun Metal	Chloride of Zinc	66	37	.....
Copper	Chloride of Zinc	60	40	.....
Lead	Tallow or Rosin	33	67	.....
Block Tin	Rosin	99	1	.....
Tinned Steel	Chloride of Zinc	64	36	.....
Galvan. Steel	Hydrochloric Acid	58	42	.....
Zinc	Hydrochloric Acid	55	45	.....
Pewter	Galipoli Oil	25	25	B. I. 50
Iron and Steel	Chloride of Ammonia	50	50	.....
Gold	Chloride of Zinc	67	33	.....
Silver	Chlorida of Zinc	67	33	.....
Bismuth	Chloride of Zinc	33	33	B. I. 34

CLEANING PREPARATORY TO HARD SOLDERING.

Before brazing, the articles to be brazed should be thoroughly clean and all foreign substances removed, either by filing, scraping, grinding, or by the use of a sand-blast. Brass or bronze parts can be cleaned by dipping in a solution of one-third nitric acid and two-thirds sulphuric acid. This same solution can also be used to clean and remove the scale after brazing.

From the foregoing it is apparent that a good deal has to be done before hard soldering can really begin. It will not be wise, however, to neglect any of the preparatory measures, as the surfaces should be ultra clean, the proper flux should be at hand, and suitable apparatus should be available. Usually the pieces are secured by pinning, but sometimes bolts or clamps are used for holding the parts together. If practicable they should be secured in such a way that the work can be turned over during the process of brazing without disturbing the relation of the parts, thus affording a better chance to apply the flux and spelter to all parts and crevices of the joint.

HEATING.

In soft soldering the temperatures are usually so low (600 degrees Fahr. or less) that the heating operation is quite a simple one. But this is scarcely the case with hard soldering. The temperatures at which the hard solders melt are so high that usually special apparatus must be employed to provide the heat and hold it when it is provided. The temperatures for hard soldering run up as high or nearly as high as the melting point of copper. They may be as low as the melting point of zinc or even less, depending upon what we choose to call hard solders. Usually the work itself will have to be heated in order to avoid chilling the hard solder and perhaps even to facilitate the union of the hard solder and the work.

One of the first things to be grasped in hard soldering with brasses is that it is good practice to make the space between the surfaces of the work just as thin as circumstances will allow. In general the thinner the film of brass which unites the surfaces of the work the better and stronger the union. This is quite different from the practice in oxy-acetylene and oxy-hydrogen welding. The brass, when properly melted, is very penetrating and will seek out and fill the thinnest crevices. The essentials in hard-soldering operation are really few in number. After the surface is in proper condition and the right solder, one of the chief items is supplying the heat. The usual practice is to heat the work and to depend largely or entirely upon the heat thus communicated to melt the solder. It is a good plan to arrange things so that as soon as the work is hot enough, the solder or spelter together with the flux will start to flow and will actually flow by gravitation into the crevices. It is often possible to have spelter and flux both in powdered form and intermingled in just the right proportions. However, if we do not know the right relative amount of flux, and it seems inadvisable to make sure by using an excess, then it may be best to make no attempt at intermingling spelter and flux in a single powder.

For instance, suppose we desire to braze together the ends of a ring that is flat inside. After the surface is mechanically cleaned, the ends are forced together. The ring is then hung by a wire or otherwise in such a way as to have the joint at the lowest point and then the heat is started beneath it. When the work has become hot enough the solder will flow into the crevice and do the job. It is to be noted that it is important in such work to heat the joint evenly. If one part is sufficiently hot and another part not, then you will have imperfect brazing. It will in many cases be much more difficult to get the necessary heat than to arrange for easy movement of the hard solder and flux. The latter will be found to be only a matter of a little ingenuity, while the former calls for adequate provisions. There are two things about the heat, one is the temperature, the other is the correct amount of heat, so it is important to understand the difference. An acetylene flame when fed by acetylene

and oxygen under adequate pressure will have an exceedingly high temperature, but there will not be a very great amount of heat.

For a hard-soldering job a goodly amount of heat is needed, consequently if spelter or brass is used that requires 1,600 degrees Fahr. for its fusion then heat must be supplied to the work at a still higher temperature. This illustrates the second requisite that the temperature must be high enough.

In cities illuminating gas is ordinarily available and it is one of the best means to employ with air under pressure in connection with the gas pipe. This junction is located a short distance back of the outlet. Both pipes back of the junction should have an individual cock or valve to regulate the supply of gas and air.

Sweating solder into joints is a very common practice used on copper and brass tubing, also on brass boxes for engine connecting rods and split bushings and for bearings used on machinery of all classes.

They are usually sweated together prior to machining in order to hold the two halves in alignment when finishing the sides and boring. The finished surfaces forming the joint between the brasses are first tinned or covered with solder. This is done by heating the brasses enough to melt the solder, then applying a flux such as sal ammoniac and finally the solder. After tinning the brasses are then heated and joined evenly together and allowed to cool. The halves are separated after the machining has been done by heating them until the solder melts and the bearing is ready for use.

STEEL WOOL.

SOME EXPERIENCE WITH A LITTLE KNOWN CLEANING MEDIUM.

WRITTEN FOR THE METAL INDUSTRY BY GEORGE P. BUTLER, NIAGARA FALLS, CANADA

Recently reading a review of the experiments of Galvani and Dr. Valli, by Richard Fowler, published 125 years ago (1793) I note that a substance called "Metalic Shavings" was used to clean rust and tarnish from articles experimented on, (Deposition). I am wondering if this cleaner was similar to what is known as steel wool; if it was, its use as a metal cleaner in plating rooms is one of the lost arts.

Steel wool is made in several grades, fine and coarse, so that by its use almost any kind of cleaning or polishing can be accomplished. Given a thorough trial it will be found to be indispensable in japanning, plating, moulding, etc.

The use of japan as a protective, or decorative covering for metal articles, has since 1914 increased more than one thousand per cent. A salesman for a prominent varnish house, recently informed me that he is selling twenty barrels of japan now where he sold one in 1914. This is due in part to increased industrial activity, and to the shortage and high cost of pig tin. Too much cannot be said of the value of steel wool in a japan room. Batches of work taken from the ovens will frequently show drips, runs, and other defects this is not always the fault of the workman; some japans will drip after being placed in the oven no matter how much care has been taken to avoid it. This is generally known as secondary drip. The method employed in most factories to "doctor" such defects is to rub down with emery cloth or sandpaper. Years ago I followed this practice myself and never could get a good job. Given a second dip and baking, the scratches made by the emery cloth were clearly observable. A wad of steel wool in the hand applied will quickly and effectually smooth out such defects and the articles given a second dip will bake smooth and show no scratches.

In rubbing down for a fine fiuish the use of steel wool will show results equal to pumice and the work done in half the time. Emery cloth and sand paper should never be used in a japan room. Steel wool is the ideal cleaner for such work. A short time ago the manager of a Cincinnati concern, secured a supply of steel wool, and after giving it a thorough trial, the results proved very satisfactory. They have discontinued the use of emery cloth in their japan department. Now, this man had previously told me he had no knowledge of steel wool—never heard of it.

To get an unbiased opinion in the use of steel wool in a plating plant, I sent a quantity to the foreman in a factory, where exceptionally fine work in nickel, copper and brass is done, with the request that the wool be given a good trial and results noted. He says: "The steel wool has had a good tryout, and will say it can be used to advantage in a plating room. For cleaning rust and tarnish in hollow ware, it is the best thing I ever handled. I thing this wool can be used for endless purposes in a plating room, such as ours, and make a clean all around job. It is also excellent for cleaning rheostats, and tank rods; however, the tank rods should be removed, as particles of steel from the wool would fall into the solution."

The wool quickly removes nickel from articles that have peeled and leaves a smooth surface to renickel. Iron and steel articles (polished) left over night or a day or two in a plating room will develop rust. A boy with a wad of the wool quickly puts them in excellent shape to run through the cleaner for plating.

A wad of the finer grade of steel wool on a moulder's bench will ensure keeping his pattern and tools clean and bright.

The sure sign of an up-to-date factory is clean windows. Shop windows are difficult to clean. Several operations are generally found necessary. One operation is all that steel wool requires, no glass is so soiled that the wool cannot clean. If there are brass sign plates, railings, machine parts, etc., use a wad of fine steel wool to polish up; you will find it has the multitude of pastes beat a mile.

NICKEL-PLATING SHEARS

It is not always the fault of the nickel solution that produces peeling on the edges of shears when being resharpened after plating. This trouble has also been overcome by the proper methods of cleaning. As a preventative, the shears after cleaning, should be immersed in a 10 per cent. solution of hydrofluoric acid and water as this solution is more effective than sulphuric or muriatic acid dips.

A nickel solution that should give excellent results on shears is composed of the following materials:

Water	1 gallon
Single nickel salts	8 ounces
Sal ammoniac	¾ ounce
Boracic acid	1 "

Voltage 2 to 2½. These proportions may be eventually increased to 14 ounces of nickel salts, 2 ounces of sal ammoniac and 3 ounces of boracic acid.—C. H. P.

ELEMENTS OF ELECTRO-CHEMISTRY

SOME INSTRUCTION FOR THE PLATER WHO WISHES TO UNDERSTAND THE THEORY OF WHAT HE DAILY PRACTICES. WRITTEN FOR THE METAL INDUSTRY BY JOSEPH HAAS, JR.*—FIFTH PAPER.†—CONDUCTION IN SOLUTIONS.

OHM'S LAW, FARADAY'S LAW, AND OTHER DEFINITIONS.

When a current of electricity flows through any uniform conductor, the strength of the current depends on the difference of potential between two points and the resistance of the conductor. This relation that exists between the difference of potential or electrical pressure, the resistance of a conductor, and the strength of the current, has been expressed by Ohm in the form of:

$$I = \frac{E}{R}; \quad E = IR; \quad R = \frac{E}{I}$$

where I stands for amperes, E for volts, R for resistance. When the current is measured in amperes, difference of potential in volts, resistance in ohms, we obtain the definition that an ampere is the strength of current produced in a conductor which has a resistance of one ohm, and between the ends of which there is a potential difference of one volt. A further definition may be of advantage. If we took a uniform cylinder of mercury 106.3 cm. long, weighing at 0 deg. C. 14.4521 grams, having a cross section of 1 sq. mm., and across the ends established or applied one volt pressure, upon measuring the strength of the current, we would find it to be one ampere. The resistance of the column of mercury is therefore one ohm. No matter what voltage is applied across the ends, the amperage would be numerically the same as the applied voltage, because the resistance of the column of mercury always is one ohm.

Whereas Ohm's Law is a quantitative relation between electro-motive force, resistance and strength of current, Faraday's Law is a quantitative relation between the amount of electricity and the amount of decomposition in a solution of an electrolyte. The unit for quantity or amount of electricity is the coulomb. The connection between the coulomb and ampere is such that a coulomb is the quantity of electricity conveyed by a current of one ampere in a second. In equation form the expression is:

Coulombs (F) = ampere (I) $\times$ time in seconds (t), or $F = I \times t$.

Also since, 1 ampere per second = 1 coulomb,
1 ampere per hour (3,600 sec.) = 3,600 coulombs,
$\therefore$ 1 ampere-hour = 3,600 coulombs.

Faraday undertook a careful quantitative study of electrolysis and determined the relation between amount of electricity which passed through a solution, and the amount of decomposition it had caused. He took into account the effect of changing the size of the electrodes, and their chemical nature, also the amount of the electrolyte. By varying the amount of the current, he found that in all cases, the amount of decomposition of the solution was the same for the same amounts of current. His conclusion therefore was that, the amount of decomposition of a solution caused by the current to be proportional to the amount of electricity that had flowed through it. He then electrolyzed solutions of various salts by passing the same amount of current through them in series, and weighed the metal deposited from each solution. He found that the amounts of metal separated, or deposited were proportional to the combining weights of the elements. Where gases were evolved at the anode or cathode, or both, this relation also held true. In the case of an elementary or simple ion, the combining weight is equal to the atomic weight divided by the valence. In the case of a complex ion, as are many of the anions, the combining weight is equal to the molecular weight divided by the valence. These two facts observed by Faraday led him to generalize: (1) The amount of decomposition caused in a solution of an electrolyte by the passage of equal quantities of electricity, are for the same electrolyte, equal; (2) for different electrolytes, proportional to the combining weights of the ions. From these generalizations of Faraday, we come to the conclusion that chemically, equivalent quantities of all ions have the same capacity for electrical energy.

THEORY OF IONIZATION AND THE ELECTRON THEORY OF ELECTRICITY AND MATTER.

It is held by many of the leading scientists, that "negative electricity" consists of ultimate particles of matter that they have called "electrons." The mass of the electron has been estimated to be 1/1000 the mass of the hydrogen atom, and the electric charge has been estimated as 1.1×10^{-19} coulombs. The atoms of elements are assumed to consist of an aggregation of large numbers of electrons enclosed in a shell of positive electricity. This positive electricity, in a given atom, is equal to that of all the negative charges of the electrons in the atom, the atom consequently containing neither an excess of positive or negative electricity. The number of electrons in a given atom of an element, are assumed to be constant for that element, but the number varies among other elements, the number increasing with increasing atomic weights of the elements. The most characteristic property of the elements is the adaptability which their atoms have for electrons. The atoms of metals like sodium (Na), potassium (K), silver (Ag), known as electropositive elements show an enormous tendency to lose an electron. Thus positively charged particles are formed: Na minus an electron becomes Na^{-E} or Na^{+}; K becomes K^{-E} or K^{+}; Ag becomes Ag^{-E} or Ag^{+}. The electro negative elements like chlorine (Cl), have a tendency to gain an electron. Thus chlorine would be expressed: Cl^{+E} or Cl^{-}. These views of the electron theory lead us to assume that in a substance like salt (Na Cl) where we have a Na atom with a tendency to lose an electron, and a Cl atom with a tendency to gain an electron, both tendencies would be satisfied by the passage of the electron from Na to Cl; $^{-}$ Na Cl $=$ Na^{-E} Cl^{+E} $=$ Na^{+} Cl^{-}. It is possible therefore, that the atoms of a molecule already possess electric charges, and that the atoms are held together in the molecule by the electric attraction of opposite charges. But when Na Cl is dissolved in water, there is a decided decrease in the attraction between the charged atoms within the molecule and the result of the process of ionization is: Na^{+} Cl^{-} $=$ Na^{+} $+$ Cl^{-}. The charged particles consequently are ions only when they have become separated and have become independent particles.

It is this view of electricity and of matter that allow us to comprehend Faraday's Law. Otherwise we would be at a loss to comprehend why from a cyanide copper solution, we can obtain twice the amount of copper with the same amount of current, as we can from a copper

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†This series began in April, 1918.

sulphate solution. The electron theory explains why ions carry whole units of electricity, univalent (1); divalent (2). In terms of the electron theory a univalent negative element is one that carries one electron in excess; a divalent, two electrons in excess, etc. A univalent positive element has lost one electron, and a divalent has lost two electrons.

The Electro-Chemical Equivalent.

The most exact measurements that have been made upon the amount of metal deposited by a current of electricity have been made on silver. It has been found that one coulomb deposits 0.0011175 grams of silver. This quantity is known as the "electro-chemical" equivalent of silver. By means of Faraday's law we can calculate the electro-chemical equivalent of another metal, as nickel. The atomic weight of nickel is 58.68, but being a divalent element its equivalent weight is 29.34. Silver has an atomic weight of 107.93 and its equivalent weight is the same since its valence is one. Hence the weights of silver and nickel separated by the same quantity of electricity are in the ratio 107.93 : 29.34. The electro-chemical equivalent of nickel will be

$\frac{29.34}{107.94} \times 0.0011175 = 0.000305$. In accordance with Faraday's second law one gram equivalent (the chemical equivalent in grams) of any metal requires the same amount of electricity to deposit it. This quantity has been found to be 96540 coulombs. The passage of this amount of electricity through a solution of a simple electrolyte has been found to quite accurately yield one gram equivalent of material at both anode and cathode. In the cases where more than one reaction occurs simultaneously at an electrode, the meaning of the law is taken that the total amount of material deposited makes up one gram equivalent. That is in the case of the brass solution where copper and zinc come down simultaneously at the cathode, 96,540 coulombs deposits x equivalent of copper and y equivalents of zinc. But $x + y = 1$ equivalent.

The Coulometer.

The fact that a given amount of current always separates or deposits the same amount of any metal from its salts, gives us a very efficient and easy method of measuring the quantity of electricity which flows through a solution in a given time. A cell constructed for the purpose of measuring current is known as a coulometer. It consists of a solution of:

$CuSO_4$	150 grams—5.29 ozs.
H_2SO_4	50 grams—1.76 ozs.
Alcohol	50 grams—1.76 ozs.
Water	1 litre—1.06 qts.

Contained in any suitable glass jar, with two electrodes, one for the anode and the other for the cathode. The cathode must be accurately weighed before and after the current has passed. The solution should be stirred. A very simple stirrer can be made by using a toy motor fastened to a stand and attaching a glass rod flattened at the bottom to the motor. At the end of the test, the cathode is washed with water, alcohol, and dried by igniting. By weighing the cathode, and subtracting from this weight the weight of the cathode before electrolysis, the weight of deposited copper is obtained. The plater may put the coulometer to use in several ways. It may be that he desires to know whether his ammeter readings are correct. In that case, by taking about 300 c. c. of the above solution in a beaker and placing in the electrodes, connecting ammeter in series with the coulometer and connecting the whole to a source of current, he deposits copper at the cathode and can record the readings on the ammeter. Assuming that the ammeter reading was 10 amperes and that electrolysis was continued for 6 minutes, then the quantity of electricity or coulombs = 36,000 1 ampere hour ($I \times K = 10 \times 360 = 3{,}600$). One ampere hour should have deposited 1.184 grams of copper. If more copper has been deposited, the ammeter reading has been low. If less copper has been deposited, the ammeter reading has been high.

Another application to which the coulometer may be put is in measuring current efficiency of plating solutions. The current efficiency of plating solutions is determined by a comparison of the amount deposited with the amount that should have been deposited as calculated from Faraday's law. The coulometer can be connected in series with the plating solution the current efficiency of which is to be determined, where the total current passing is not too great. But, the best practice is for the coulometer to be placed in shunt through which by means of suitable resistance ¼ or ½ of the total current passes through the coulometer. Later, in a series of articles, actual measurements, arrangement of apparatus and calculations of this and of other important principles will be given. The coulometer has the advantage over the ammeter in measuring and determining current efficiency in that it accurately gives ampere-hours, although there may be a considerable variation in current. The coulometer requires no attention, whereas the ammeter requires constant attention, so that its reading is constant by varying resistances, or variations in current must be recorded. This necessitates standing by the determination while it is going on.

(To be continued)

CORRECTIONS.

A number of errors have been noted in previous installments of this series of articles.

In the April, 1918, issue on page 162, the formula given in the last line as "Al_3; — Al = 3," should be $AlCl_3$ — Al = 3.

In the July, 1918, issue on page 315 in the second paragraph the sentence beginning "The kinetic theory is explained, etc.," should read: The kinetic theory explains this by the fact * * * and also the lengths of their journey will be less.

In article 4 in the same issue on page 316 the sentence beginning, "If we assume, etc.," should read: If we assume that 2,000 molecules of sulphate of copper are dissolved in a liter of water, there would be 4,000 ions present if the 2,000 molecules ionized completely.

MALLEABLE NICKEL.

Nickel of 98 to 99 per cent. purity can be kept malleable for working if melted in clay-lined crucibles and suitably deoxidized with about 1 per cent of manganese to secure soundness. Graphite crucibles should not be used for the work, as the nickel tends to absorb the carbon, which renders it hard and unfit for rolling. If more convenient, a solid clay crucible may be used. The manganese can be added to the pot with the nickel, but no charcoal should be used as a flux or protection, as that again would introduce carbon with the above-mentioned trouble of hardness. The oxidation of the nickel produces a slag, which acts as a protection from excessive oxidation. Melters of nickel for sheet-rolling usually prefer an open mould to a closed one, on account of the rapid chilling of the metal rendering casting in closed moulds difficult.

ZINC CYANIDE PLATING SOLUTIONS*

AN ARTICLE DESCRIBING METHODS OF PREPARATION

BY F. J. LISCOMB.

In order to secure definite information regarding the best conditions of operation of plating solutions, it is necessary first to obtain reliable methods for preparing and analyzing solutions of any given composition. This need has been especially felt in connection with such mixtures as the zinc cyanide plating solutions, in which, as will be explained shortly, a given composition can be produced by different methods, and for which the methods of analysis in ordinary use may be wholly inadequate.

GENERAL PRINCIPLES.

When zinc cyanide $Zn(CN)_2$ is dissolved in sodium cyanide NaCN, a double compound, sodium zinc cyanide $Zn(CN)_2 . 2NaCN$ is formed by simple addition, which may be represented thus:

$$Zn(CN)_2 + 2NaCN = Zn(CN)_2 . 2NaCN.$$

Similarly, when zinc hydroxide, $Zn(OH)_2$ (or zinc oxide, ZnO) is dissolved in sodium hydroxide (caustic soda, NaOH) a double compound, sodium zincate, Na_2ZnO_2 or $Zn(ONa)_2$ is formed,† (by the elimination of water).

Strictly speaking, the compound formed is more probably $NaHZnO_2$ or $Zn(OH)(ONa)$. Since, however, the amount of alkali actually required to form a clear solution is at least equivalent to that in the compound $Zn(ONa)_2$, we will employ that formula for simplicity.

(Of water)

$$Zn(OH)_2 + 2NaOH = Zn(OH)_2 . 2NaOH = Zn(ONa)_2 + 2H_2O \text{ or}$$

$$ZnO + 2NaOH = Zn(ONa)_2 + H_2O.$$

It is also possible to dissolve zinc cyanide in sodium hydroxide, or to dissolve zinc oxide in sodium cyanide. In each case the same product is formed, i.e., a mixture of sodium zinc cyanide and sodium zincate.

$$2Zn(CN)_2 + 4NaOH = Zn(CN)_2 . 2NaCN + Zn(ONa)_2 + 2H_2O.$$

$$2H_2O + 2ZnO + 4NaCN = 2Zn(CN)_2 + 4NaOH = Zn(CN)_2 . 2NaCN + Zn(ONa)_2 + 2H_2O.$$

From these consideration, it is obvious that when, as is usually the case, it is desired to have considerable free alkali in a zinc cyanide solution, a solution identical in all respects can be prepared by the substitution of zinc oxide for all or a part of the zinc cyanide, and the use of a proportionately greater amount of sodium cyanide, and less amount of sodium hydroxide. The net saving of such a substitution is represented by the economy of adding zinc in the form of a zinc oxide instead of zinc cyanide, and of adding cyanide in the form of sodium cyanide instead of zinc cyanide. The question of whether satisfactory solutions may be prepared with less total cyanide is not considered in this paper, and is not connected with such a substitution.

PREPARATION OF SOLUTIONS.

The following factors showing the relations by weight between the various constituents are used in the subsequent or similar calculations:

Zinc cyanide × 0.56 = zinc
Zinc cyanide × 0.69 = zinc oxide
Zinc cyanide × 0.68 = equivalent sodium hydroxide
Zinc cyanide × 0.84 = equivalent sodium cyanide
Zinc × 1.80 = zinc cyanide
Zinc × 1.24 = zinc oxide
Zinc oxide × 0.80 = zinc
Sodium hydroxide × 1.23 = equivalent sodium cyanide.
Sodium cyanide × 0.83 = equivalent sodium hydroxide.

Grams per liter × 0.134 = ounces per gallon.

When zinc oxide is dissolved in sodium cyanide, an equivalent amount of sodium hydroxide, almost exactly equal to the weight of the zinc oxide used, is liberated. In order therefore to determine how much zinc cyanide in a plating solution may be substituted by zinc oxide, all that is necessary is to multiply the desired zinc cyanide content by 0.69 or for practical purposes 0.7, giving the equivalent amount of zinc oxide. If this amount is equal to, or less than the desired amount of sodium hydroxide, the entire amount of zinc oxide indicated may be used. Should this amount be greater than the desired amount of sodium hydroxide, only as much zinc oxide may be used as the desired sodium hydroxide content. In the latter case, sufficient zinc cyanide must also be added to furnish the desired zinc content.

The additional amount of sodium cyanide to be used is easily determined by multiplying the amount of zinc cyanide to be replaced by zinc oxide, by 0.84. The total cyanide to be used will then be equal to this plus the original content of sodium cyanide.

The amount of sodium hydroxide required is simply the originally specified amount, minus the amount of zinc oxide used.

Suppose it is desired to prepare the following two solutions by the use of zinc oxide:

CUSTOMARY FORMULAS.‡

	I		II	
	oz/gal	g/L	oz/gal	g/L
Zinc cyanide	10	75	10	75
Sodium cyanide	4	30	8	60
Sodium hydroxide	8	80	4	30

The amount of zinc oxide equivalent to the zinc cyanide is equal to 10 oz/gal × 0.7 = 7 oz/gal or 52.5 g/L. The use of this amount of zinc oxide would liberate an equal amount of sodium hydroxide. In solution I, where 8 oz/gal or 60 g/L of sodium hydroxide is desired, the full amount of sodium hydroxide will be required. In solution II where it is desired to have only 4 oz/gal of sodium hydroxide, only that amount, i. e., 4 oz/gal of zinc oxide may be used instead of 7 oz/gal. Consequently only 4/7 × 10 = 5.7 oz/gal or 43 g/L of the zinc cyanide can be substituted, leaving 4.3 oz/gal or 32 g/L of zinc cyanide to be added. The amount of sodium cyanide to be used in addition to that originally specified, is 0.84 times the amount of zinc cyanide replaced, i.e., 0.84 × 10 = 8.4 oz/gal or 63 g/L in solution I; and 0.84 × 5.7 = 4.8 oz/gal or 36 g/L in solution II. The revised formulas will then be as follows:

FORMULAS USING ZINC OXIDE.

	I		II	
	oz/gal	g/L	oz/gal	g/L
Zinc cyanide	0	0	4.3	32
Zinc oxide	7	52.5	4.0	30
Sodium cyanide	12.4	93	12.8	96
Sodium hydroxide	1.0	7.5	0	0

In the preparation of such solutions, it is necessary to first dissolve the sodium cyanide and hydroxide in one-half or less of the final volume of water and then to slowly pour the zinc oxide, previously mixed with water to form a thin paste into the first solution while stirring. When the solution is complete, additional water may be added to produce the desired volume or specific gravity.

*Published by permission of the director, Bureau of Standards.

‡In these formulas and calculations, no attention need be paid to the presence of minor constituents, such as aluminum sulphate, tartrates, etc.

The exact economy to be effected by such substitutions will depend upon the market prices of the chemicals involved, and can be readily computed for such examples as are given. In this connection it should be borne in mind that zinc oxide contains 80 per cent of metallic zinc as against 56 per cent in zinc cyanide; and that sodium cyanide contains 53 per cent of cyanogen (CN) as against 45 per cent in zinc cyanide. Solutions prepared by this method have been found to produce results equal to those obtained in solutions of similar composition prepared from zinc cyanide. The best composition to be used is now being investigated. In the meantime it is a simple matter for anyone to duplicate such solutions as are found by them to be, or known to be satisfactory, by using zinc oxide as explained.—"American Electro-Platers' Monthly Review," November, 1918.

ACCEPTANCE OF AN OFFER COMPLETES THE CONTRACT

SOME IMPORTANT INFORMATION FOR THE UP-TO-DATE BUSINESS MAN.

WRITTEN FOR THE METAL INDUSTRY BY RALPH H. BUTZ

There are many instances where disputes have arisen between a seller and a buyer because the seller wanted to withdraw an offer after it had been accepted by the buyer. In the majority of cases of this nature the acceptance is transmitted through the mails, and the seller has not received the letter of acceptance at the time he wants to call off the offer. Under such a condition he is of the opinion that as long as the acceptance has not been received by him he is at liberty to withdraw his offer. In fact, there are very many business men who are of this opinion, and when such is the case it merely proves that they are not well informed concerning these points in the law of contracts. For this reason it will be interesting to business men and will no doubt amply repay them to read what the law is on such points.

When a seller makes an offer by letter and it is understood that the buyer is to accept the offer by letter, then the buyer's acceptance is binding upon the seller as soon as such letter of acceptance has been posted in the mail, even though the seller claims to have withdrawn the offer before the acceptance reached him.

This principle can best be illustrated by a case in point. Bradley wrote a letter to Strafford, making an offer of material at a certain price, with the understanding that the offer was to be accepted within one week from the date it was made. Strafford mailed his letter of acceptance on the sixth day following the date of the offer. Bradley did not receive this letter until four days later, and then he claimed that there was no contract because he had not received the acceptance in the time specified. The Court held that the acceptance was binding upon Bradley, because Strafford had accepted within the time mentioned in the offer. The contract arose from the time the acceptance was posted in the mail.

If, as Bradley claimed, he meant that the acceptance would have to be in his hands within seven days, then he should have stated this in making the offer. If he had done this he would have been amply protected. Instead of writing that the offer would have to be accepted within seven days, he should have written that the acceptance would have to be in his hands within that time, and then Strafford would not have had any cause for action against Bradley, for it would have been plain that the acceptance had not been in accordance with the terms of the offer.

After an offer is properly accepted the seller can not call it off without being liable for breach of contract. The contract is then completed and it can not be cancelled unless both parties give their consent. If the seller does not want to be liable he must withdraw the offer before it is accepted, and give notice to the buyer of such withdrawal. An offer is not cancelled until the buyer receives the notice to this effect. Thus, if the seller decides to withdraw his offer and writes to the buyer that the offer is withdrawn, such a withdrawal is not effective until the buyer receives the letter. Even though the seller mails his withdrawal before the buyer posts his acceptance, the seller is still bound to fulfill the contract.

Jacobsen wrote a letter to Andrews in which was the following offer: "I will sell you ten gallons of White Cross liquid at ten dollars a gallon, but at this price I must have your acceptance by return mail." Andrews wrote and posted his acceptance immediately upon receipt of the letter containing this offer. Several hours later he received a telegram from Jacobsen, which read: "Offer for White Cross liquid withdrawn." In this case it was plain that Jacobsen could not escape liability because Andrews had accepted the offer before he received notice of its withdrawal.

When the condition, "by return of mail," is made in an offer, it is usually construed as meaning, not the very next mail, but on the same day. However, in the case just stated, it was Andrews' prompt acceptance that completed the contract. If he had waited until later in the day, he would have had the telegram, and after that his acceptance would not have been valid.

In making an offer which should be accepted within a short time it is always advisable to state the conditions plainly, so that there will be no mistake in their interpretation. If a seller makes an offer, which is to be accepted within two days, he will protect himself by stating that the acceptance must be received by him prior to a certain time. If he merely states that the offer must be accepted within two days, and the buyer does post his acceptance within this time, but the letter is lost and never reaches the seller, it may still be possible for the buyer to claim breach of contract because the seller does not fulfil his part of the contract.

WHERE THE CONTRACT ARISES

Occasionally it is necessary to determine where a contract arises, since the laws of various states differ, and the enforcement of the contract depends upon the laws in the state where the contract arose. The established rule in such cases is that the contract arises at the place where the offer is accepted. If a Philadelphia seller makes an offer to an Omaha buyer, and the acceptance is posted at the latter place, then the contract is completed at Omaha, and the laws of Nebraska must be relied upon if any difficulties arise in the enforcement of the contract. The reason for this rule is that the acceptance is necessary to complete the contract, and at the place where the contract is completed, there the contract arises. This rule holds good when acceptances are made by letter, telegram or telephone. When the parties are dealing face to face, the place when they are at the time the agreement is made is the place where the contract arises.

THE ART OF ENGRAVING AND EMBOSSING

AN EXHAUSTIVE ARTICLE DEALING WITH THE PRODUCTION OF ARTISTIC EFFECTS IN METAL WORK, WRITTEN FOR THE METAL INDUSTRY BY EASY WAY.

(SIXTH PAPER)

The use of the mask appears to have originated in Greece and has become an element for decoration and is used to represent artistic principles and during the Renaissance period was used extensively in conjunction with other elements in the form of a scroll or stalk ornament. The terminal was the mask and from its center sprang flowers and fruits. Such elements are the universal choice of ages and are produced by being worked into designs of either geometrical, natural and artificial forms, animals or the human figure, either separately or combined. The combination may consist of any of the elements of decoration by even distribution, order balance, proportion, repetition, alteration, symmetry, radiation, variety, contrast, fitness, repose and which are explained as follows: Even distribution is the space that should be filled in by the elements duly observing a balance between them and ground work. All elements made use of should each fulfill a purpose, having a definite reason for its use with regard to the artistic necessities of the whole design and not merely because it is required to "fill in." Furthermore, in a complete and well thought out design any element that is taken away would mar the effect of the design so that it should be so well conceived that no portion of it could be taken away without impoverishing its general conception and completeness. A design is at fault in even distribution when it is complete, so far as the general conception and use of the elements are concerned. That is, when the addition or subtraction of another element would spol its construction and effect, for it does not then conform to the law of even distribution. While on the one hand it is obvious that other elements are required to fill out the spaces, yet this cannot be done without destroying the constructive value of the design.

This leads to the conclusion that designs should be well considered as to relation and proportion, which exists between the various parts and that a definite plan should be followed in building up designs. Order should be observed both in the selection and in the distribution of the elements, that is, a unity should exist between all parts of the design. The elements should be selected with a view of probable combination and this combination should be well and carefully considered with regards to the effect to be produced in connection with the object the design is for.

SOME EXAMPLES OF ENGRAVING SHOWING THE USE OF THE MASK.

The principles of balance and proportion are of the greatest importance and should also be well considered in regard to various parts that shall exist between the parts engraved. It is a much too common thing to see the whole of an exposed surface of an article engraved in the most lavish manner without a plain relieving surface of any description. Such work produces a sense of unrest and often irritating with an expression of its being too busy, or in other words, too much cut up, as there is no place upon which the eye can rest to obtain a relief from the effect of too much character. There are few designers, aside from the Japanese, who can engrave the entire surface of an object with success so that it will balance the va-

rious designs of the different elements and also to arrange them in proportion of mass and line and still gain the repose that is necessary to all good designs, well proportioned and based on natural laws so that harmony results.

Repetition or sameness and alteration have enough of what is common, for both to be considered together, yet sufficient difference to be easily distinguishable. Repetition consists in the same element being used continuously as with a border design where it occurs the most often in geometrical forms and figures and natural objects, thus affording an extensive manifestation of the principle of repetition joined together to produce the homogeneous effect intended—a study of the elements employed in design and their use throughout. The historical period of art presents a key to the use of repetition and its place in decorative design and teaches that the less meaning from the point of view of either beauty or symbolism a form possesses, the more legitimate is its use as a repeated element. It not only does not offend our perceptions but appears to be absolutely necessary to gain the object aimed at. The more meaning an element expresses, the more it should be emphasized by being isolated either by the absence of other decoration, by being surrounded by plain matt or ground, or even the straight lines of a border, or by less developed and more unmeaning elements and the more beauty of symbolism shown by an element the less frequently should it be employed. While alteration is the alternate repetition of the same element, the space between is filled with other elements and this is often done when it is considered necessary to use it because of its symbolic nature which makes it appropriate for the article to be decorated. Yet if such an element was repeated without others it would induce monotony or the full effect would be considerably modified by repetition. It is in such cases introduced at intervals, the spaces between only being filled by elements of a lesser interest.

A FLORAL DESIGN ON METAL.

Symmetry is the leading line upon which the elements are built and forms the skeleton of the design, which is generally equal on both sides. However, it is not necessary that all details of designs should be the same on both sides, but with a beginner it is advisable to strictly adhere to the general rule of symmetry until their artistic sense and judgment have been developed. In this way it will enable them to feel when and where and to what extent the law of variety dictates or suggests a departure from the law of symmetry.

Radiation is a very essential feature in any decorative design as points exist from which the leading lines apparently proceed in most designs. Other subordinate points also exist from which minor elements begin and there are three kinds of these, that which begins from a single point, a vertical line and a horizontal line. All good designs must have their elements radiating perfectly in a good curve and with just the kind of curve which most nearly fulfills the requirements demanded by proportion and balance to make the curve natural, easy and yet strong. For this purpose, practice and observation is the best teacher.

Variety can be introduced in so many different ways that each stage of designing affords an interest which it would not otherwise possess and has been termed the salt of ornament which cures the insipidity of repetition. Monotony often results from the continued repetition of any element, whereas if variety is introduced judiciously, with good taste, and with a sense of fitness of things, monotony need never appear and the design will be a delight.

ENGRAVED PLATE SHOWING THE USE OF HUMAN AND ANIMAL FIGURES.

In planning a design, the arrangement of the leading lines may be determined by choosing the various elements to be used and by arranging them so that the necessary contrast is obtained. In the arrangement of the details variety can be brought in by the use of different elements in similar corresponding places so as to avoid monotony that is often induced by the too regular occurrence of the same design, and which has much to do in deciding what particular element should be used in a given place. Variety has varied from age to age and the art of each period has gained or suffered by the profusion or poverty that existed at that particular time. In introducing variety it should be the aim to do so only when a distinct necessity for such use arises. If this is not done, a tendency will arise and rapidly develop to introduce it in a very lavish manner, and the result of this would be that other principles would be utterly disregarded and the design ruined. Success is much more likely to be gained by a due consideration of all the principles of design and of all the requirements of the articles to be ornamented.

THE PRODUCTION OF ROLLED ZINC IN THE UNITED STATES

SOME INTERESTING STATISTICS COLLECTED BY C. B. SIEBENTHAL OF THE UNITED STATES GEOLOGICAL SURVEY.

ZINC PRODUCERS

For many years nearly all the sheet zinc made in the United States was produced by two of the older and larger companies—the Matthiessen & Hegeler Zinc Company, of La Salle, Ill., and the Illinois Zinc Company, in the adjoining town of Peru, Ill. Other companies, particularly the manufacturers of glass fruit jars having zinc tops, have rolled zinc for their own use, and some that furnish sheet zinc to lithographers have also rolled their own zinc. The great demand since the beginning of the war for sheet zinc to line packing cases made for shipment overseas, especially cases containing munitions or other material that is likely to be affected by salt air, has led still other firms into the business of rolling zinc. In addition to the two companies mentioned specifically above the following firms now make rolled zinc: Ball Brothers Glass Manufacturing Company, Muncie, Ind.; Hazel Atlas Glass Company, Wheeling, W. Va.; New Jersey Zinc Co., Palmerton, Pa.; American Zinc Products Co., Greencastle, Ind.; Edes Manufacturing Co., Plymouth, Mass.; E. Phillip & Sons, South Hanover, Mass.; and The Platt Brothers & Company, Waterbury, Conn.

PRICES, PAST AND PRESENT

Rolled zinc has always been quoted at so much per pound with discounts and extras for different gages and special sizes and shapes. In 1914, according to Metal Statistics, the base price ranged from 7 to 8.75 cents a pound. In 1915 the price began at 8.75 cents and rose to 33 cents on June 9, fell to 15 cents August 23, and rose to 23 cents at the close of the year. In 1916 the price reached 25.5 cents on April 22 but dropped to 15 cents on July 11 and ended the year at 21 cents. In 1917 the base price of sheet zinc remained nearly stationary, declining to 20 cents on April 25 and to 19 cents on April 26. On February 15, 1918, the base price of zinc sheets was fixed by the Government at 15 cents and the price of rolled zinc plates at 14 cents.

ZINC ROLLED IN THE UNITED STATES, 1915-1917.

		1915	1916	1917
ZINC SHEETS:				
Quantity	pounds	77,567,096	73,760,938	90,002,569
Value		$10,952.609	$13,758,613	$16,465,052
Average value per pound		$0.14	$0.185	$0.18
BOILER PLATES AND SPECIAL SHEETS:				
Quantity	pounds	2,562,856	3,198,693	6,900,293
Value		$345,572	$564,814	$1,111,240
Average value per pound		$0.135	$0.175	$0.16
ZINC STRIPS:				
Quantity	pounds	10,295,859	18,682,653	20,350,089
Value		$1,445,806	$3,299,386	$3,190,559
Average value per pound		$0.14	$0.17	$0.155
TOTAL ROLLED ZINC	pounds	90,425,811	95,642,284	117,252,951
TOTAL VALUE		$12,743,987	$17,622,813	$20,766,851
AVERAGE VALUE PER POUND		$0.141	$0.184	$0.177
ROLLED ZINC EXPORTED:				
Quantity	pounds	(a)	25,024,182	33,027,991
Value		.....	$4,540,146	$5,730,792
Average value per pound		.....	$0.181	$0.174
DOMESTIC CONSUMPTION OF ROLLED ZINC	pounds	.....	70,618,102	84,224,960

(a) Figures not available.

PRODUCTION STATISTICS

The United States Geological Survey, Department of the Interior, has for many years collected statistics showing the production of zinc, but while the output of rolled zinc was practically limited to that of the two companies in Illinois mentioned above the Survey could not publish statistics showing the output without disclosing individual business. The increase in the number of producers, however, has now made it possible to give these figures. A canvass of the industry by C. E. Siebenthal, of the Survey, gives the statistics presented in the following table. If the figures showing the exports, as published by the Bureau of Foreign and Domestic Commerce, are subtracted from the figures showing the production, the result will represent the domestic consumption. It should be borne in mind, however, that the sheet zinc used by the Government in shipping munitions overseas is not reported as exported.

THE FUTURE USES OF ZINC

The New Jersey Zinc Company made its first output in 1917, and the American Zinc Products Company in 1918. Additions to capacity amounting to nearly 50 per cent are being made at four of the principal mills to meet the increased demand for zinc for war uses and that which will result from the prevailing strong movement to find and establish new uses for sheet zinc and to extend the present uses. Every such extension, especially the substitution of sheet zinc for sheet copper and brass and for tin plate, will stimulate the zinc market and relieve to some extent the shortage of copper and tin. The War Industries Board has ordered the use of sheet zinc instead of galvanized iron or steel for refrigerator linings, a use that will require about 10,000 tons of rolled zinc. Sheet zinc can also be substituted for galvanized iron in roofing, spouting, guttering, garages, household utensils, and hospital ware.

Both the production and the value by classes of product given in the table are subject to slight correction because some producers that sell from a single base price do not keep their sales separated according to classes of product (which are arbitrary anyhow) and were to that extent obliged to make estimates; others, who themselves use the greater part of their output, had to estimate values. But the total production, value, and average price given may be considered accurate. The average price agrees closely with the average price shown by the exporters' manifests.

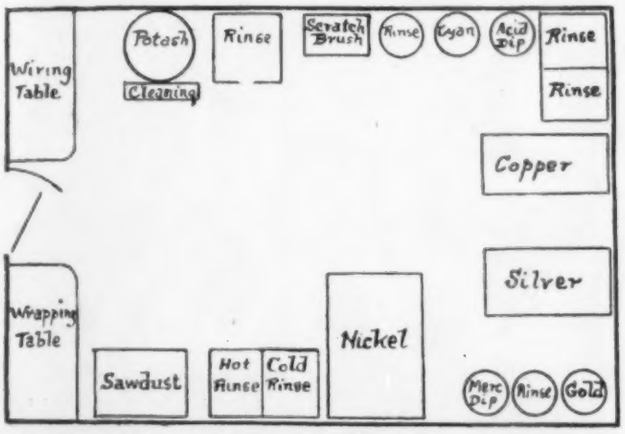
ORDER AND METHOD IN THE PLATING SHOP

AN ARTICLE DEALING WITH ECONOMICAL AND EFFICIENT OPERATION TENDING TO INCREASE PRODUCTION

By "ELECTROGRAPHER."

The first anxiety of the proprietor of a plating shop is generally to get "orders" into it, but that of the man who is responsible for running it successfully is to evolve order out of their execution. This is not always easy of accomplishment, but it is safe to say that in few departments connected with metal working is it so essential to have method and order as permanent features, and in even fewer is it so difficult of attainment.

The great fundamental necessity in all electro-plating work is, of course, absolute cleanliness and the greatest aid to this is undoubtedly order in the method of working. Where half the people engaged in the shop are tumbling over the other half in their endeavors to do their task this is impossible. Too often this sort of thing arises from having too many places to put things, which in practical working is almost



COMPLETE AND PRACTICAL LAY-OUT FOR A PLATING SHOP

as great an evil as having nowhere to put anything. Having benches and tables in different positions in the shop where goods can be dumped down in various stages of their preparation or finish, offers inducement for the thoughtless and untidy of the workers to have a place for everything and nothing in its place.

The handling of goods in the plating shop should be strictly by a process of rotation, and that should commence at the door and should finish there. The writer, from many years of experience, has come to the conclusion that the rule of the road in the plating shop should be "keep to the right." In explaining that, it is simply necessary to say that work brought into the shop for plating should be put down at the left hand side of the door, and in its subsequent stages should be worked round the shop to the right till it arrives finished, at the door again. It is not always possible to arrange for matters to work as easily as this, yet there are many places where it could be done, but never is, and that for the lack of a little foresight.

In the illustration a plan is given of a plating shop where this principle was carried out, and working was, in consequence, most successful and easy. There will probably be noticed more rinse waters than are usually discovered in most plating shops, but the initial outlay on these is small and the expense in keeping them filled infinitesimal, so there is no reason if they facilitate matters why they should not be installed. Besides, can there be too much clean water in a plating shop? It will be seen how this extra provision of "rinses" prevents any running about.

Work passes to the right automatically, and practically begins to walk back to the door as soon as it enters the shop. Probably one or two other things may be found that will excite the reason why in some minds, but this is the plan of a shop that existed successfully for some years and is not one drawn up by an inexperienced idealist.

Such an arrangement was found most helpful to a very small staff which had a tremendous lot of work to do, week in and week out, all the year round. But for some such easy method of working the amount of work could never have been done. Here, there was no running from one corner of the shop to the other, the only bit of back working was when the operator happened to notice any suspicious looking blobs of water on anything he was about to hang in the vat. Then back to the potash, perforce it must go. This was very seldom. If by any chance it became frequent, attention to "the boil" was at once given.

The absence of the dynamo will be noted, in the plan, and for the all sufficient reason that it was not there—nor should it ever be in a plating shop. It is not a fit article to be in any room where corroding and deleterious fumes are being generated every minute, nor is it, with its grease and continual buzz, fit to be in a room where every spot of fatty matter has its terrors for the sensible operator and may do serious mischief with a careless one. Electro plating too, is a process demanding care and thought all the time, and the noise of a dynamo is apt to distract attention from matters that would probably soon go wrong if it were drawn away from them for only a moment. In the shop shown, there was plenty of room in the centre, but it was not wasted, for it gave a freedom of movement which made rapid working a pleasure. If a dynamo must be in the shop, here was the place for it, but it should be screened off all round and a door should shut it up to itself. Near this door should be provided soap, water and towel, that the hands could be washed before resuming work at the vat.

In the case given as an example, the dynamo was in an immediate adjacent outbuilding where it was out of danger of damage from any source, and its grease and noise could cause no trouble. Current was brought in by copper rods, and the voltmeter, ammeter, resistance boards, etc., were, of course, in their usual positions. All chemicals were in another room with other stores and no operation was carried out in the plating shop except those necessary for the process of deposition of metal. A mixed kind of work was done, but quite the largest proportion consisted of malleable iron parts of certain machines of which quite large quantities were nickeled every week. For this, a word of praise must be accorded to the solution in the vat, which was far and away the best the writer ever worked, and never gave the slightest trouble.

Although the illustration is drawn to no particular measurements, it will be seen there was no difficulty

in getting round any of the plating solutions, or of reaching over and around the various dips, rinses, etc. Some idea of relative sizes may be gathered from the nickeling vat, which was five feet long by three feet wide. Ample light and ventilation were provided by windows round two sides of the room and partly round another. Water pipes ran along the walls of the room and taps were provided over each rinse. The sawdust tin was screened in by a hood all round, to prevent dust flying about. It was heated by hot water pipes from a boiler which supplied heat to other parts of the works. Racks and shelves were provided for the placing of tools and materials that were in immediate use, or likely to be. The floor was of red bricks, laid at a slight fall to the centre, where an almost imperceptible depression made a useful gutter leading to a drain near the door. This was an excellent arrangement, for if, by any accident, any acids or other liquids were spilled, a pail of water and a broom soon disposed of them. The bricks were laid on concrete composed of coke and breeze mixed with cement, and they had cement mortar between. This floor was always dry and not so cold as one of stone and concrete would be.

Amongst the plating vats will be noticed one marked "Copper." This is really a "terminological inexactitude," to put it finely, because, as a matter of fact, it was a solution for plating gun-metal, and a very good one, too. Although it was not a copper solution, it answered the purpose of one where such was required to give undercoats for silvering on, etc. The chief use of it, however, was for coating a certain number of the small malleable iron parts, before mentioned, which were required to have a gun-metal finish instead of a nickel one, and very well they used to look. This was a regular standing order, and so when making up the baths, to save having two, a purely copper depositing one was omitted and this one took its place and filled the program splendidly.

The silver solution was not in everyday use. It was required for certain goods which used to come in batches, with intervals between, although sometimes it would be used all day and every day for a week or two together, when there was a rush of special orders. It was a good solution, but was perhaps not such a smooth working one as the nickel bath, which was exceptional and certainly never gave any trouble at all for over four years.

The gold solution was in constant use for small jobs, and was worked hot, a small bunsen burner underneath supplying the heat required. It proved to be the most troublesome solution in the shop to work, and was finally worked out as rapidly as possible and replaced by one the writer made up. This proceeded well for a year or two, but it is probable that the class of work done was so mixed that no solution used alone would give satisfaction with it for a very long time together. Eventually a different arrangement was made, which was facilitated by a difference in the class of work done.

One of the most important things in the shop was the potash boil, for the simple reason that the major portion of the work used to come fresh from the polishers, covered in grease and dirt. Consequently "the boil" was kept fairly strong in potash, and brass goods being cleaned in it were often discolored unless quickly disposed of; if so, they were further treated accordingly—hence the need for the scratch brush and cyanide dip to be to hand.

The scratch brush was run on a good and easy working foot lathe. This was preferable for the class of work done; and the amount of it, to a power lathe, and worked well and comfortably. In some cases the value of the power lathe for a scratch brush is doubtful. It is safe to say that the tremendous speed one sees them running at is no good to anything or any one except the brush maker. With a light running foot lathe there is no hard work in scratch brushing, and the speed can be regulated in accordance with the class of goods in hand, and that from minute to minute—no mean advantage, and certainly so to the brush.

The other necessary parts of the plant shown on the plan are sufficiently familiar to every plater to need description. It may be said that the hot rinse was drawn in from a hot water tap from a boiler used for other purposes in another part of the factory, and was kept hot by the same run of pipes that heated the sawdust. It was a good method, and answered admirably.

When the articles arrived from the polishing shop they were put down on, or under, the wiring table, and the girl used to wire them and pass them to the right toward the potash. The malleable iron machine parts which were nickeled in hundreds, and at times in thousands per week, were certainly very suited to easy handling. Each had a hole at the end, so was rapidly hooked on a wire. Another advantage tl ey had was their compactness for placing in the vat; as many as twelve or fourteen could be hung separately on every foot of rodding, and as they were required to be well and thickly plated overcrowding had to be avoided. At this number to the foot they would plate well and rapidly, an excellent color, and without smears and discoloration on any part of them. After potashing, they were placed in the rinse water. and as they had to stand there some minutes, at times, before plating, they were run through the acid dip or "sharp water" and again rinsed before placing in the vat.

It will be noticed that two rinses were provided after the acid dip. One of these was for use when brass goods were run through the cyanide dip, and the other for iron and steel goods, after the acid dip, and they were kept strictly to these respective uses. It will be observed that their positions aid considerably the method of working to the right. If any article had to be "coppered" before silvering, it was put in the vat adjoining, which answered that purpose. It was the writer's practice to scratch-brush such goods before silvering. That occasioned almost the only bit of back working ever done in the shop, but of course it caused no perceptible inconvenience because its subsequent stages were again "to the right."

Where an article was mercury dipped—and it was necessary sometimes—before silvering, the operator had only to go a pace to the right of the silver vat to accomplish this. Such a position was found to be more convenient than placing the mercury dip between the copper and silver vats. Besides, in the case of requiring it for a gilding job—well, there it was, ready for either solution.

The nickeling was done by an alkaline solution which never required any attention except filtering once, and yet it did heavy loads of work constantly. It had three rows of cast anodes and two rods for work to hang on, running the long way of the vat. It seldom did work of such a size or required any different arrangement from this, which was one that answered well for the class of goods plated. From this to the rinse, then to the sawdust, and from that to the wrapping table were easy stages.

A GRAPHIC PICTURE OF THE HORRORS OF WAR—LET US HAVE PEACE FOREVERMORE*

A Letter from Major Robert L. Denig of the United States Marines Describes How the Marines Held the Way to Paris.

"The day before we left for this big push we had a most interesting fight between a fleet of German planes and a French observation balloon right over our heads. We saw five planes circle over our town, then put on, what we thought afterward, a sham fight. One of them, after many fancy stunts, headed right for the balloon. They were all painted with our colors except one. This one went near the balloon. One kept right on. The other four shot the balloon up with incendiary bullets. The observers jumped into their parachutes just as the outfit went up in a mass of flames.

"The next day we took our positions at various places to wait for camions that were to take us somewhere in France, when or for what purpose we did not know. Wass passed me at the head of his company—we made a date for a party on our next leave. He was looking fine and was as happy as could be. Then Hunt, Keyser, and a heap of others went by. I have the battalion and Holcomb the regiment. Our turn to rebuss did not come till near midnight."

"We at last got under way after a few big sea bags had hit nearby. Wilmer and I led in a touring car. We went at a good clip and nearly got ditched in a couple of new shell holes. Shells were falling fast by now, and as the tenth truck went under the bridge a big one landed nearby with a crash and wounded the two drivers, killed two marines, and wounded five more. We did not know it at the time and did not notice anything wrong till we came to a crossroad, when we found we had only eleven cars all told. We found the rest of the convoy after a hunt, but even then were not told of the loss, and did not find it out till the next day.

"We were finally, after twelve hours' ride, dumped in a big field and after a few hours' rest started our march. It was hot as hades and we had had nothing to eat since the day before. We at last entered a forest; troops seemed to converge on it from all points. We marched some six miles in the forest; a finer one I have never seen—deer would scamper ahead and we could have eaten one raw. At 10 that night, without food, we lay down in a pouring rain to sleep. Troops of all kinds passed up in the night—a shadowy stream, over a half million men. Some French officers told us that they had never seen such concentration since Verdun, if then.

"The next day, the 18th of July, we marched ahead through a jamb of troops, trucks, etc., and came at last to a ration dump where we fell to and ate our heads off for the first time in nearly two days. When we left there the men had bread stuck on their bayonets. I lugged a ham. All were loaded down. Here I passed one of Wass's Lieutenants with his hand wounded. He was pleased as Punch and told us the drive was on—the first we knew of it. I then passed a few men of Hunt's company bringing prisoners to the rear. They had a Colonel and his staff. They were well dressed, clean and polished, but mighty glum looking.

"We finally stopped at the far end of the forest near a dressing station, where Holcomb again took command. This station had been a big, fine stone farm house, but was now a complete ruin—wounded and dead lay all about. Joe Murray came by with his head all done up; his helmet had saved him. The lines had gone on ahead, so we were quite safe. Had a fine aero battle right over us. The stunts that those planes did cannot be described by me.

Field Covered with Dead.

"Late in the afternoon we advanced again. Our route lay over an open field covered with dead. We lay down on a hillside for the night, near some captured German guns, and until dark I watched the cavalry, some 4,000, come up and take positions.

"At 3:30 the next morning Sitz woke me up and said we were to attack. The regiment was soon under way, and we picked our way under cover of a gas-invested valley to a town, where we got our final instructions, and left our packs. I wished Sumner good luck, and we parted.

"We formed up in a sunken road on two sides of a valley that was perpendicular to the enemy's front; Hughes right, Holcomb left, Sibley support. We now began to get a few wounded; one man, with ashen face, came charging to the rear with shell shock. He shook all over, foamed at the mouth, could not speak. I put him under a tent, and he acted as if he had a fit.

"I heard Lieutenant Overton call to one of his friends to send a certain pin to his mother if he should get hit.

"At 8:30 we jumped off with a line of tanks in the lead. For two kilos the four lines of marines were as straight as a die, and their advance over the open plain in the bright sunlight was a picture I shall never forget. The fire got hotter and hotter, men fell, bullets sung, shells whizz-banged, and the dust of battle got thick. Overton was hit by a big piece of shell and fell. Afterward I heard he was hit in the heart, so his death was without pain. He was buried last night and the pin found.

"A man near me was cut in two. Others when hit would stand, it seemed, an hour, then fall in a heap. I yelled to Wilmer that each gun in the barrage worked from right to left, then a rabbit ran ahead, and I watched him, wondering if he would get hit. Good rabbit! I told Wilmer that I had a hundred dollars, and be sure to get it. You think of all kinds of things.

"About sixty Germans jumped up out of a trench and tried to surrender, but their machine guns opened up, we fired back, they ran, and our left company after them. That made a gap to be filled, so Sibley advanced one of his to do the job; then a shell lit in a machine gun crew of ours and cleaned it out completely.

Lost 17 Out of 20 Officers.

"At 10:30 we dug in; the attack just died out. I found a hole or old trench, and when I was flat on my back I got some protection. Holcomb was next me; Wilmer some way off. We then tried to get reports. Two companies we never could get in touch with. Lloyd came in and reported he was holding some trenches near a mill with six men. Cates, with his trousers blown off, said he had sixteen men of various companies; another officer on the right reported he had and could see some forty men, all told. That, with the headquarters, was all we could find out about the battalion of nearly 800. Of the twenty company officers who went in, three came out, and one, Cates, was slightly wounded.

"From then on to about 8 P. M. life was a chance, and mighty uncomfortable. It was hot as a furnace, no water,

*From the New York Times.

and they had our range to a 'T.' Three men lying in a shallow trench near me were blown to bits.

"We had a machine gun officer with us and at six a runner came up and reported that Sumner was killed. He commanded the machine gun company with us. He was hit early in the fight by a bullet, I hear. I can get no details. At the start he remarked: 'This looks easy—they do not seem to have much art.' Hughes's headquarters were all shot up. Turner lost a leg.

"Well, we just lay there all through the hot afternoon. It was great—a shell would land near by and you would bounce in your hole.

"As twilight came we sent our water parties for the relief of the wounded. Then we wondered if we would get relieved. At 9 o'clock we got a message congratulating us, and saying the Algerians would take over at midnight. We then began to collect our wounded. Some had been evacuated during the day, but at that we soon had about twenty on the field near us. A man who had been blinded wanted me to hold his hand. Another, wounded in the back, wanted his head patted, and so it went; one man got up on his hands and knees. I asked him what he wanted. He said, 'Look at the full moon,' then fell dead. I had him buried and all the rest I could find. All the time bullets sung and we prayed that shelling would not start while we had our wounded on top.

ALGERIANS BADLY "SHOT UP."

"The Algerians came up at midnight and we pushed out. They went over at daybreak and got all shot up. We made the relief under German flares and the light from a burning town.

"That night the Germans shelled us, and got three killed and seventeen wounded. We moved a bit further back to the crossroad, and, after burying a few Germans, some of whom showed signs of having been wounded before, we settled down to a short stay.

"It looked like rain, and so Wilmer and I went to an old dressing station to salvage some cover. We collected a lot of bloody shelter halves and ponchos that had been tied to poles to make stretchers, and were about to go when we stopped to look at a new grave. A rude cross made of two slats from a box had written on it:

"'Lester S. Wass, Captain U. S. Marines, July 18, 1918.'

"The old crowd at St. Nazaire and Bordeaux—Wass and Sumner killed, Baston and Hunt wounded, the latter on the path, a clear wound, I hear, through the left shoulder. We then moved further to the rear and camped for the night. Dunlap came to look us over; his car was driven by a sailor, who got out to talk to a few of the Marines, when one of the latter yelled out, 'Hey, fellows! Anyone want to see a real live gob—right this way.' The gob held a regular reception. A carrier pigeon perched on a tree with a message. We decided to shoot him. It was then quite dark, so the shot missed. I then heard the following remarks as I tried to sleep: 'Hell; he only turned around'; 'Send up a flare'; 'Call for a barrage,' etc. The next day further to the rear still, a Ford was towed by with its front wheels on a truck.

"We are now back in a town for some rest and to lick our wounds. As I rode down the battalion where once companies 250 strong used to march, now you see fifty men with a kid second lieutenant in command; one company commander is not yet 21.

"After the last attack I cashed in the gold you gave me and sent it home along with my back pay. I have no idea of being 'bumped off' with money on my person, as if you fall into the enemy's hands, you are first robbed, then buried perhaps, but the first is sure.

"Baston, the lieutenant that went to Quantico with father and myself, and of whom father took some pictures, was wounded in both legs in the Bois de Belleau. It was some time before he was evacuated and gas gangrene set in. He nearly lost his legs, I am told, but is coming out O. K. Hunt was wounded in the last attack, got his wounds fixed up and went back again till he had to be sent out. Coffenburg was hit in the hand—all near him were killed. Talbot was hit twice, but is about again. That accounts for all the officers in the company that I brought over. In the first fight 103 of the men in that outfit were killed or wounded. The second fight must have about cleaned out the old crowd.

"To picture a fight, mix up a lot of hungry, dirty, tired, and bloody men with dust, noise, and smoke. Forget the clean swords, prancing horses, and flapping flags. At night, a gas-filled woods, falling trees and bright, blinding flashes—you can't see your neighbor—that is war. In the rear it is all confusion. The General told me 'Hurry to such a place, all goes well, we are advancing!' His staff miles away, all clean—one was shaving, another eating hot cakes—we had not had a hot bite for two days. As I reached my jumping off place, wounded men, killed men, horses blown to bits—the contrast!

"We advanced ten kilometers, with prisoners and guns, and the bells rang in New York for the victory, while well dressed girls and white-shirted men, no doubt, drank our health in many a lobster palace."

The officers mentioned in Major Denig's letter are: Lieut. Col. Berton W. Sibley, Essex Junction, Vt.; First Lieutenant Clifton B. Cates, Tipton, Tenn.; First Lieutenant Horace Talbot, Woonsocket, R. I.; Captain Arthur H. Turner; Charles S. Turner, 188 West River street, Wilkes-Barre, Pa.; Captain Bailey Metcalf Coffenberg, 30 Jackson street, Staten Island, N. Y.; Captain Albert Preston Baston, Pleasant avenue, St. Louis Park, Minn.; Captain Lester Sherwood Wass, Gloucester, Mass.; Captain Allen M. Sumner, 1824 S street, Northwest, Washington, D. C.; Lieut. Col. Thomas Holcomb, 1535 New Hampshire avenue, Washington, D. C.; Second Lieutenant John Laury Hunt, Gillet, Tex.; Captain Walter H. Sitz, Davenport, Iowa; First Lieutenant John W. Overton, 901 Stahlman Building, Nashville, Tenn.; Major Egbert T. Lloyd, 4900 Cedar avenue, Philadelphia, Pa.; Major Ralph S. Keyser, Thoroughfare, Va.; Captain Pere Wilmer, Centreville, Md.; Lieut. Col. John A. Hughes, Rear Admiral William Parks, Post Office Building, Philadelphia, Pa.

[The foregoing letter gives the best description that we have seen of actual participation in the World War. It is for this reason we have published it. We believe our readers should have an opportunity to see what men really went through in the fight for liberty. —Ed.]

COPPERITE: HIGH-SPEED ALLOY.

Copperite is a new high-speed alloy. It is said to be an alloy of zirconium and nickel. It has a bright silvery lustre and a specific gravity much lower than other alloys used for high-speed work. Copperite contains no carbon or iron, and consequently is not a steel. Its melting point is only about 1150 deg. C., and owing to the fact that the alloy remains in a liquid state for a considerable period before solidifying, difficult castings can be made with ease. No heat treatment is said to be required, the hardness being varied by changing the proportion of the constituents. Cutting tools have been produced with a hardness of 250 up to 500 Brinell, the latter still retaining sufficient toughness to withstand heavy roughing cuts.

EDITORIAL

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CONTENTS

PEACE

As July 4, 1776 stands out in the history of the United States of America as the birth of independence for this one country so will November 11, 1918, be a bright mark in future history as the birth of independence for the world. After nearly five years of the most bloody and devastating war of all ages German autocracy with its bestial cruelty and hateful arrogance has been crushed and was forced to surrender unconditionally on November 11, 1918.

Now in the midst of universal rejoicing and the celebrations going on over the return of the American troops from the far off battlefields of Europe, it is well to look a little to the future. The world wants peace and peace for ever more. The best guarantee of lasting peace is mutual understanding, plus respect. Consequently there can be no League of Nations unless it is founded on the understanding and mutual gratitudes that have been created between the United States and the nations with whom it has been associated in the great struggle.

It would be better for this country to send no one to the Peace Congress, to withdraw its armies from Europe and make a separate peace with the Central Powers, preserving the friendship of its present associates, than to sacrifice that association in the eager desire to exploit that friendship in the formal language of a constitution of the world or in the effort to impose upon two great nations, who have made sacrifices for the common good ten fold as great as ours, restrictions which would imperil their future, while merely gratifying our vanity or ministering to our real or sham idealism.

As long as the United States stands with France, Great Britain, and Italy, bound by common purposes and enlightened intelligence, the peace of the world is assured and it is threatened the moment these nations begin to drift apart. Sane and sensible Americans know that the British, French and Italian people are eager to preserve and expand the friendship cemented by the blood of the men of all four nations shed in the recent war. The great basis for international peace is international friendship and confidence, not written agreements, whether these agreements be guaratees of neutrality or constitutions of a League of Nations.

The best promise of peace in the next generation is the public sentiment of France, Italy, Great Britain, and the United States with respect of each other, represented in the official circles of Great Britain, France and Italy by men who personally share the sentiments and opinions of their people, men who do not hesitate to express these opinions.

READJUSTMENT AND RECONSTRUCTION

While the war will not be legally ended until peace is proclaimed matters have gone far enough now for the world to be sure that hostilities are at an end. The terms of the armistice signed on November 11, 1918, are being carried out by Germany as quickly as possible and its duration is likely to be extended. The President of the United States is now on the ocean on his way to attend the Peace Congress which, it is stated, will convene in Paris on December 20. A great convention for the deliberation of problems concerning readjustment has just been held at Atlantic City, N. J., under the auspices of the United States Chamber of Commerce. The results of this convention are given in this issue of THE METAL INDUSTRY.

Coincident with the tremendous task of reconstruction to be carried on in the devastated countries of Europe are the problems of readjustment in business enterprises in this country. Already there is evident in all parts of the country signs of that business unrest following the end of a great war. War contracts are being cancelled and the great plants that have been devoted to the manufacture of war materials and munitions must be diverted to industries of peace. We already hear from different parts of the country of plants being shut down and help laid off or in others the force being diminished. All these things must be taken into account during the period of transition from war to peace.

President Wilson evidently had this in mind when he said in his late message to Congress on policies of reconstruction and readjustment:

> "American business is too big a thing, too serious a thing, too abounding in youthful energy and determination to be alarmed or confused by the problems of peace coming on the heels of the problems of war which we have so successfully solved."

One of the biggest problems to be solved during the readjustment period is that of ships. Just as in wartime there was urgent need for ships and ships so will there be in peace times. Enormous quantities of supplies, building materials and commodities of all kinds for not only European nations, but also for all countries of the world, must be sent out.

No manufacturer or distributor could afford to depend on competitors for trucking or deliveries. But American foreign commerce has in the past been handled almost entirely by ships of other nations. In 1915 only 14.3 per cent. of our total foreign commerce was carried by American vessels. This total had risen to only 18.5 per cent. in 1917. This nation cannot build permanent foreign trade unless it has ships enough to handle at least 60 per cent. of its overseas business. Some progress in the direction of providing more ships flying the American flag has been made in the last year and a half. Of the 6,000,000 tons of shipping within the jurisdiction of the United States Shipping Board, nearly half consists of foreign ships which may or may not be retained in American service after peace is once declared.

The present program of the Shipping Board will add approximately 10,000,000 gross tons to the American mercantile fleet. This would eventually give us a total of about 14,000,000 tons, which might be considered ample for the present. Many of the proposed ships could probably not be used, however, in overseas service for various reasons. Moreover, all information given to the public indicates that only relatively little additional carrying capacity will be available to American commerce for some time. In this connection it is interesting to note comments made by a contemporary journal, The Scientific American, in relation to the desire of the Secretary of the Navy to build 156 new WAR vessels in addition to the program laid down in 1916.

The Scientific American says:

> Verily, the ways of some men are past finding out. Here at the very time when our President is planning a trip to Europe (he is now on the water) to establish upon an unassailable foundation a League of Peace, we see his favored lieutenant asking the war-weary people of the country to build an entirely new fleet of over 300 warships, including 20 super-dreadnaughts, costing, in these days of high prices, some thirty millions apiece, and twelve battle cruisers that will cost even more.
>
> Who is the possible enemy that Mr. Daniels sees lurking among the fleets of our Allies (or associates, if he prefers the term) whose gallant tars have so lately been joined with ours in the task of sweeping the common foe from the seas? * * * For the future our policy with that of Great Britain and of all the champions of peace and brotherhood, should consist in building ships merely at a pace that will make good the losses due to depreciation through age of the older vessels. At the most, we should complete the program of 1916. To double it in this hour of retrenchment and conciliation would be preposterous.

We thoroughly agree with our contemporary, but we would like to see the same energy and enthusiasm expended on the furthering of a war program put forth on a program for ships of peace. Unless thorough and practical plans for overcoming our present lack of shipping space are made at once, all arrangements of American business for overseas trade will fall flat. It was suggested at the Atlantic City convention of the United States Chamber of Commerce that the Government be asked to take the following steps:—

1. Place at the disposal of the foreign trade of the United States adequate tonnage to handle shipments to and from the markets of the world.

2. Establish regular lines of steamers between the United States and advantageous foreign ports.

3. Arrange to continue its present merchant shipbuilding program to the end that an American mercantile marine of sufficient tonnage shall be built up capable of carrying America's foreign commerce under the American flag.

While the ships are being provided to carry the products of this country to the markets of the world and to bring back those things not obtainable here, business must continue to advance. There is only one certain way to stabilize the situation so as to inspire general confidence, and that is by constructive expenditure upon public works to take the place of war expenditures. The shift of labor from public employment to private employment would thus take place gradually instead of suddenly, the readjustment would be made gradually and the confusion and disturbance which is apprehended would be minimized and no longer feared.

COST OF THE WAR

SOME STAGGERING FIGURES COMPILED BY THE BANKERS TRUST COMPANY OF NEW YORK.

THE ANTAGONISTS.

In the titanic struggle which has just come to an end all former standards of economic strength have been discarded.

Of the estimated world population of about a billion seven hundred million human beings, there is scarcely a group which is not materially affected by the conflict.

This was truly the war of every man, woman and child of the nations involved, and not alone a war of military forces.

Nineteen nations, with combined populations of 1,145,-030,000 fought for the cause of liberty, and five others, with total populations of about 11,500,000 severed diplomatic relations with the Teutons.

Four nations with combined populations of upwards of 146,000,000 fought under the leadership of Germany for the autocratic principle of government, which they hoped to establish as a world principle with the German Kaiser as the supreme world autocrat.

Twenty-two nations with populations of about 152,000,000 have maintained a neutral attitude, while Russia, the great unknown factor, upon whose final alignment much depends, has around 182,000,000 people within her borders.

A roll call of the nations as to whether they favored the democratic or the autocratic principles of government would bring the answer "for liberty" from the representatives of over seventy-two per cent. of the inhabitants of the globe, while only six per cent. would answer "nay."

THE COST.

IN LIVES AND IN MONEY TO ALLIES.

The United States declared war on April 6, 1917. To mobilize our forces and put the country on a war basis we expended up to the first of August last $14,618,000,000, of which amount $8,621,971,000 represented our direct war costs and $5,996,515,000 represented loans to our allies, this for one and a third years of warfare. Up to the same date, after having been at war just four years, France had sacrificed to the cause probably 1,200,000 lives and had seen around 1,500,000 men incapacitated for military service, while she had expended about $22,500,000,000, of which upwards of $1,500,000,000 represented loans to her allies. Great Britain, her Dominions and Colonies in the same period lost about six hundred and fifty thousand of her men who yielded up their lives on the altar of liberty, while over eight hundred thousand more were permanently incapacitated for service. The money cost to Great Britain of the four years of warfare was $34,687,000,000, including loans to her allies of $7,835,000,000.

Altogether, it is estimated that the human cost of the four years of warfare to all of the Liberty Allies was about 4,500,000 men killed, and in addition 5,000,000 men so injured as to be permanently incapacitated for service, and that the money cost was just about a round one hundred billion dollars. These figures do not include the loss of lives and the physical sufferings of the civilian populations of Belgium and northern France, of the inhabitants of the devastated districts of the eastern front, and of the Balkans; nor do they include the results of the unparalleled atrocities committed by the Turks upon the Armenians and their other nationals of the Christian faith. No one can possibly know what the sufferings and losses of these peoples have been.

IN SHIPS.

While considering those things which are behind us it will be of interest to note here that the gross tonnage of shipping lost since the war began, due principally to the activities of German and Austrian submarines, amounted to August 1 to 14,229,976 tons; on the other hand, German owned ships which have been seized by the Allies and put to the use had a gross tonnage of 2,589,000, and newly constructed ships a gross tonnage of 8,986,266, a total offset to the above loss of 11,575,266 gross tons, making the net loss of tonnage 2,-654,710. The money loss involved by the submarine activities may be roughly estimated at about $7,500,000,000, about equally divided between ships and cargoes.

For three years of the war, that is until the third quarter of 1917 was reached, the shipping losses greatly exceeded the launchings, but at that time a turn for the better came and since then the adverse conditions have steadily diminished until in May of this year the launchings began to exceed the losses. The great shipbuilding operations now being carried on should insure a steady gain in tonnage hereafter.

LOSSES OF THE AUTOCRATS.

It is a satisfaction to note that over one hundred and fifty German submarines have been sunk. It is believed that the destruction of submarines proceeded at a rate in excess of their new construction. The shipping of the autocrats has been swept from the seas; their foreign trade has ceased and may not be revived easily. Thanks to the vigilance and courage of the officers and men of the allied navies, the losses incurred in transporting troops to France have been very small. The German submarine warfare, while a disagreeable factor, was a failure from a military standpoint.

All these losses of men and property to the nations at war have been caused that there might be satisfied the lust for power and the unrighteous greed of the German people and their unprincipled although able rulers, who beginning with the "unscrupulous diplomacy of Bismarck" in the years between 1862 and 1890 had consistently and persistently been advancing their schemes for world domination until the day came in 1914 when they thought they could quickly and at a slight cost to themselves accomplish their nefarious purpose.

The Teutonic allies in the past four years have sacrificed the lives of possibly three and a half million men; have probably had more than that number wholly incapacitated for further military service, and have expended in money at least forty five billion dollars.

The following table will be found to be of much interest when studied in connection with the preceding paragraphs:

MILITARY COST OF FOUR YEARS OF WARFARE.

August 1, 1914 to July 31, 1918

Sacrifice to the Cause of Liberty	Lives Lost	Permanently Disabled	Money Cost in Millions
British Empire (exclusive of Canada, India and Africa)	600,000	750,000	$37,000
Canada	40,000	55,000	1,000
France	1,200,000	1,500,000	22,500
Italy	600,000	750,000	8,000
Russia [Say to Sept. 1917]	2,000,000	2,000,000	26,250
United States [16 Months]	7,700	9,500	14,600
Total	4,447,700	5,064,500	$109,350
Deduct duplications due to estimated advances between above Countries, less estimated direct costs for smaller countries			9,350
Net Cost to Liberty Allies			$100,000
Sacrificed on the Altar of Autocracy			
Austria-Hungary	750,000	850,000	$13,000
Bulgaria	85,000	90,000	700
Germany	2,500,000	2,500,000	30,000
Turkey	175,000	175,000	1,200
Total	3,510,000	3,615,000	$44,900

This table is based upon the best available data. Accuracy is impossible, as, for military reasons, many of the facts are not fully disclosed. It should be remembered that the United States has been a combatant only since April 6, 1917, and Italy since May, 24, 1915.

As an addition to the cost of the war to Germany, should be placed the vast amount of material collected in years of preparation, and as an offset the booty seized and indemnities collected in Belgium, northern France, the Balkans and Russia.

CORRESPONDENCE AND DISCUSSION

While we cordially invite criticisms and expressions of opinion in these columns, THE METAL INDUSTRY assumes no responsibility for statements made therein.

ELECTRO-GALVANIZING VIA SKILLED OR UNSKILLED HELP

To the Editor of THE METAL INDUSTRY:

Have you ever heard or seen statements such as the following: "Our solutions are self-sustaining." "With our solutions you can double or triple your present output." "It is not necessary to employ experienced help with our solutions." "Save the expense of a competent man. We employ unskilled labor in our jobbing department, why don't you?" etc., etc.

Have you ever seen the work turned out by these wonderful solutions handled by unskilled and inexperienced men?

I recently had an opportunity to observe the character of the deposits obtained from these prepared salts and also the class of work turned out in some of the jobbing shops that specialize in prepared salts and solutions. The statement that inexperienced help was employed was not quite true. The discharging of the manager of one of these jobbing shops and replacing him with a more experienced plater does not compare well with the advertisements of the companies regarding the employment of unskilled men in conjunction with their prepared salts.

I can safely say that I have seen some of the worst examples of electro-galvanizing turned out from such solutions and by jobbing shops. At times I have seen deposits that might be called fair, but this was more the exception than the rule. The general character of the deposit as to resisting qualities, appearance, etc., was usually alluded to as very bad. The manufacturer who used these prepared salts fared no better. It was simply trouble, rejections, poor deposits, etc.

The statement that "with our prepared salts or solutions you can increase your present production many times" usually interests the manufacturer, and I know of one manufacturer whose work had to pass inspection and a test, who discarded his old solution and used these magic salts. He found afterward that it took half again as long to obtain the deposit than with his former solution, that the appearance, grain, texture and resisting qualities did not compare with the finish of the old solution and that a gallon of the solution prepared with the magic salts cost him several times more. The manufacturer was not aware of the composition of the new solution, and it was very hard to maintain good results. All that was needed to complete the total failure of this department or make it most expensive to operate was to follow the advice of the manufacturers of the salts and employ unskilled help to operate the solutions, but fortunately the concern manufacturing the parts to be electro-galvanized employed a competent foreman.

Another large manufacturing concern having more work than its plating department could handle, had some of the smaller parts electro-galvanized in the jobbing department of one of these prepared salts manufacturers. The result was that the appearance of this work was so bad that the articles were rejected. After having the parts refinished several times with the same unsatisfactory results, inquiries were made as to the cause of the poor deposit obtained from a supposedly superior solution. The excuse offered was that some of the experienced help had left them and that they had had to employ inexperienced help. Compare this statement with the advertisements and circulars sent out broadcast by such companies, stating that unskilled help can produce wonderful results with their particular solutions.

If you seem to have any doubts as to the ability of some of these salts or the equipment offered in conjunction with them you are handed a list of testimonials. In many cases the individual or concern mentioned in the testimonial wrote it upon one condition or another and not because they had investigated the superior merits or compared them with other results. For instance, a testimonial of this character was sent broadcast throughout the country to every individual or concern who might have a plating department or were interested in one, but the man who wrote that testimonial did not know what he was advocating.

A friend of mine, who was foreman of one of the large metal working plants in the East, received one day a plating barrel of a certain make. He had, at that time, a number of different type barrels, but this particular barrel was different from any that he then had. In its new state and with its automatic devices the barrel presented an advantage over the ones he had in operation and he, therefore, welcomed it. He mentioned the matter to me and I was interested to know how it would stand up and compare in time with the others that he had in use. Several months elapsed and I received a circular letter, a "testimonial" sent out by the maker of this plating barrel. The letter was a photographic reproduction of the original and set forth the wonderful merits and the advantages of the new barrel. In fact, this testimonial lauded the barrel so strongly that it was referred to as overdone. I showed the copy of the letter to my friend. To say that he was astonished is putting it mildly. "Why, he said he had found the barrel a disappointment, a constant source of trouble and had discontinued using it." Yet here was a purchasing agent, who never went near the plating department nor knew anything about the working of such barrels, writing or signing such a letter to be sent broadcast to influence others.

Even at this time one reads of another type of testimonial that has been stretched and misconstrued such as "The Government recommends our solutions" or "The Government recommends our process," or words to that effect. The method pursued by one of these companies was quite interesting. The manufacturers, having galvanizing salts and equipment to sell and knowing that a letter from some branch or department of the Government would influence prospective users, sent a letter to a Government department asking if they did not think electro-galvanizing a good method for protecting iron and steel from rusting. Of course, the Government thought so and the firm writing the letter knew that it thought so, but what was wanted was a statement from that department to that effect. The reply came, stating that the Government considered a zinc coating a protective one and that electro-galvanizing would provide a good means for obtaining this coating, but the Government at that time was unable to say if an acid or alkaline solution gave better results.

Just imagine what would have happened had the reply stated in favor of a slightly acid solution, but it did not. So we see such advertisements as these: "The Government uses our solution" or "The Government advises the use of our solution, incidentally our equipment also," etc., etc.

I have often been asked if it is necessary to use two solutions for electro-galvanizing, as is advocated by some concerns, but since this required extra handling and extra equipment I have always answered no. Of course, the purchase of the extra equipment is very beneficial to the firm supplying it, although there are many supply houses that do not have to resort to this means to obtain business.

When the two-solution method is used both of the solutions are composed of exactly the same materials, with the exception that the first or strike solution contains a small amount of tin chloride. This method requires twice the amount of handling, twice the amount of equipment, which is quite an item, and the results produced by such a method do not compare with those of a single solution. I know this is so, and I have still to see the deposit produced day after day from two solutions that will equal and compare with that produced from a single solution. Another important factor is that the single solution is less complicated, more easily controlled and less additions have to be made, while in the two solutions the constant addition of maintaining salts from day to day are necessary.

Some maintaining salts manufactured by a company making galvanizing salts contained a very large percentage of glucose. Just why so much glucose was added each day I cannot understand. However, it does explain the poor quality of the finish obtained since the sugar is not deposited out of the solution, and this, therefore, was a constant cause for complaint by the users. When this matter was mentioned to the president of the company manufacturing the salts, he took the following attitude: "That is our solution; we say it is all right, we know it is all

right and we do not propose to change it." Being "all right" might suit him, but I have still to see the user who will say the same.

People who only read the advertisements explaining the simplicity of the operation of such equipment should hear the wail of the user when he does not get results. He sends post haste for the congenial salesman, who, when he does arrive, which is generally only when the user threatens to return the equipment, solution and all, simply talks, talks and talks.

Unlike the two Hebrew merchants who were standing on the deck of a steamship in heated argument when it was torpedoed. Seeing the ship was rapidly sinking a fellow passenger offered the suggestion to get into a lifeboat at once. Upon reaching the shore he found the two men there still in heated argument. Noting that their clothing was soaking wet, he approached them and asked how they had reached the shore and they explained: "We talked and talked and talked."

Fortunately the salesman does not talk with his hands, for if he did he would get in and show the unskilled workman how to turn out a good job, or show himself up. Instead he advises the hiring of a competent man. The argument the manufacturer puts up that he understood any inexperienced man could do the work falls on the salesman's tin ear.

I know a great many manufacturers who have learned that no matter how simple electro-galvanizing may be made to appear in an advertisement, it is much more profitable to employ a competent foreman and help in order to obtain satisfactory results at the beginning than have a bad job turned out by unskilled help, which proves to be more expensive in the end.

The question of what is a good galvanizing solution is often asked. I know of a dozen formulæ, slightly acid and alkaline, that are all producing excellent results. It is not a matter of the formula so much as it is that of brains, and to-day you can buy brains as cheap as unskilled labor, which is demanding from three to five hundred per cent more in wages than a few years ago. So it is cheaper to get an experienced man in the first place and save unnecessary expense and worry.

It is one thing to claim that unskilled help can produce a good job of electro-galvanizing and quite another to prove it.

New York, November 26, 1918. WM. VOSS.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

AMALGAMATING

Q.—I have been having trouble with a mercury amalgamating solution which is used as a parting between two nickel deposits on master plates of phonograph records. The mercury solution is made up by dissolving all the mercury in nitric acid that the acid will take up. It is then insoluble in water.

I then add enough nitric acid to bring it back in solution and then the bath is ready for use. The mercury solution is then deposited on the copper shell but it leaves a stain on some parts of the shell, and where these dark stains appear the two deposits seem to stick very tight and my shells buckle up when I go to release them and it seems impossible to straighten them out so that they are fit to use.

There is a mercury solution that will precipitate a good clear deposit but I have been unable to find it as yet.

A.—We believe that your mercury dip is too strong and we would suggest that you reduce it with fifty per cent of water and then add about 4 ounces of sal ammoniac per gallon of solution. If the stains are still produced they can be readily removed afterwards by immersing the master plates in a solution of cyanide.

Water	1 gallon
Sodium cyanide	8 ounces

We are under the impression that a solution consisting of oxide of mercury and sodium cyanide would probably give you better results. You might try the following:

Water	1 gallon
Sodium cyanide	8 ounces
Red oxide of mercury	¼ to ½ ounce

If a slight dark coating of mercury is developed in spots use the cyanide dip as noted above to remove them, but in a short time the cyanide of mercury dip would give a clear and bright coating of mercury.—C. H. P. Problem 2,644.

CLEANING

Q.—We want an electro-cleaner to avoid scouring steel articles before plating. We may add the cleaner we have tried is composed of caustic soda and a two-way switch and connection to the tank. The work acts as an anode and then vice versa, but the same always leaves a green scum which again causes us to go back to scouring to dislodge the scum. can you help us?

A.—Possibly your pressure or current is not strong enough. Add cyanide 98-100 per cent. in the proportion of 4 ounces per gallon. A reversing switch should not be necessary. The article to be cleaned should be suspended on the negative or cathode rod, and the tank must be on the positive or anode rod. No oxides can form by this process. Any staining on brass goods will be obviated by the addition of cyanide—not the expensive 95 per cent. potassium.—H. W. C. Problem 2,645.

DIPPING

Q.—What would you suggest as a bright dip for zinc? We have an order for zinc name plates (etched), and in producing them we used a dilute muriatic acid solution, which formed a heavy black deposit upon the metal. In order to remove this deposit we used a dilute bright dip of sulphuric and nitric acids, which removed the deposit in flakes and left an unsatisfactory background for the black nickel which is used to produce a black background.

Also can you give us some information as to how to obtain a black oxidized finish on zinc?

A.—We would advise that equal parts of sulphuric and nitric acids make an effective bright dip for zinc, but the dip must be used exclusively for zinc, and no copper must be dipped in the acid mixture, because it will be reproduced upon the zinc in a pulverulent form.

We imagine that the zinc that you have been using contains lead, otherwise the dilute muriatic acid should leave the surface so that it could be readily bright dipped after etching. A strong and warm solution of sal ammoniac is frequently used to produce a clean surface on zinc, but the action is much slower than when sulphuric and nitric acids are used.

To produce a black oxidized tone on zinc prepare a hot saturated solution of single nickel salts and immerse the zinc in the solution until it becomes black. This method is said to give excellent results.—C. H. P. Problem 2,646.

FINISHING

Q.—Could you advise me of a method of obtaining a black finish on etched aluminum plates immediately after etching. It must be understood that there is a resist on the etched plates which cannot be removed or attacked before the black is put on making an aluminum letter plate with a black background.

A.—For your purpose there is no doubt but that the black nickel solution will give you the best results. A black

nickel solution for aluminum plating should be prepared as follows:

Water	1 gallon
Double nickel salts	6 ounces
Single nickel salts	2 ounces
Sal ammoniac	1 ounce
Sodium sulphocyanide	3 ounces

Prepare the solution in the order given. The zinc sulphate and sodium sulphocyanide should first be dissolved in about a pint of boiling water and then added with thorough stirring to the nickel solution made up with the other seven pints of water. Use two to three volts at the start and then reduce to a half or three-quarters volt to produce a deep black deposit.

The cleaning of the aluminum is an important factor and a hot solution made up on the following basis makes a good cleaner:

Water	1 gallon
Soda ash	4 ounces
Sodium bicarbonate	4 ounces
Powdered yellow resin	¼ ounce

This cleaner is mild in its action and should not affect the resist you use.—C. H. P. Problem 2,647.

MELTING

Q.—We are mailing you an aluminum carburetor casting that we are making for the government. You will notice a small speck which we have marked with a pencil. This small speck makes the casting defective and we are having considerable trouble along this line.

A.—The casting in question was found on examination to be the alloy of copper 7, aluminum 93, which is commonly used for general casting purposes. As the iron content was 0.25 per cent, the silicon 0.44 per cent and there was no manganese present, it is assumed that the alloy was made from new copper and new aluminum, and not from scrap. There is much recovered Alloy No. 12 on the market that is badly oxidized.

In the absence of definite information as to the method of melting and process of making the alloy, we must conclude that one or both of these operations is faulty as the speck in the casting is a small blow hole.

After aluminum has become oxidized or "burnt" it is so sluggish when melted that it does not free itself from entrapped air and gases. Hence, castings full of blowholes result. Hence, also any overheating during melting should be avoided and the aluminum should not remain in the fire after it is ready to pour. Quick-melting is advisable as this reduces the time that the aluminum is exposed to the oxygen and nitrogen of the air.

In line with this idea you should make your alloy as follows:

Copper	1 pound
Aluminum	1 pound

Melt the copper in a graphite crucible but avoid overheating. Then add the aluminum a little at a time stirring well after each addition. Pour into small ingots. This "rich" alloy is used as follows to give the required mixture:

Aluminum	86 pounds
Rich alloy	14 pounds

By quick and careful melting and mixing the alloy as above, the defects found in your castings should be eliminated. Pouring at too low a heat must be avoided, however, as aluminum may be sluggish from this cause just as well as from "burning" and blowholes just as surely resulted—J. L. J. Problem 2,648.

OILING

Q.—We are having considerable trouble with the bearings in our polishing and buffing lathes. Some of them have ball bearings and they seem to be giving us the worst trouble. We ascribe it to the grease or oil we are using. How can we find out if it is adulterated.

A.—The presence of acids in oils or grease is very deleterious to the bearings, especially ball bearings as it causes more or less corrosion. To test oil for acid, clean a piece of sheet copper, cover it with oil and let it remain several days. Should a green deposit form on the copper it may be concluded acid is present. Lubricating oil or grease should be neutral in its character. P. W. B. Problem 2,649.

PLATING

Q.—How is a nickel silver solution prepared?

A.—A nickel silver solution, is merely a cyanide or silver solution with nickel syanide added in proportions of about 25 per cent of the metal content of the silver solution. As nickel does not reduce to any appreciable extent from nickel anodies or a combination alloy of nickel and silver nickel syanide must be added to keep up the nickel content. A solution may be prepared as follows:

	Water	1 gallon
	Sodium cyanide	3½ ounces
1.	Silver cyanide	2 ounces
	Soda ash	½ ounce
2.	Nickel cyanide	¾ ounce
	Sodium cyanide	¾ ounce

The silver solution should be prepared in the order given. Dissolve the sodium cyanide and the nickel cyanide separately in a small amount of water and add to the silver solution. If prepared according to above formula the solution will contain 1.61 ounces of silver and 0.45 ounce of nickel. Silver cyanide contains 80½ per cent metal and nickel cyanide 60 per cent metal. Use silver anodes and a current of 1 to 1½ volts. The usual brightener for regular solutions may be added, but as a rule the nickel has a brightening action upon the silver. The deposit of silver and nickel is much harder than pure silver deposit.—C. H. P. Problem 2,650.

SHRINKING

Q.—We would like to know if you can point out to us or send us any article telling us how to overcome certain interior shrinkage on manganese bronze castings. The castings with which we have had some difficulty are small pieces not weighing over a pound without cores. They are discs about 3 inches in diameter and 1 inch thick. Perhaps you can tell us a metal that we could use in place of manganese bronze, which has to stand a tensile strength of 30,000 pounds.

A.—The fact that you have a high shrinkage indicates that you are using a good grade of manganese bronze ingot and that your melting practice is good.

A riser of sufficient size ought to feed the casting you mention and prevent the interior shrinkage. Plain castings in manganese bronze can often be profitably cast in iron molds, a liberal allowance being made for finishing. A chill mold is similar in its effect to a riser and gives solid castings. A mold that will make size of the castings, would be a convenient size.

Molds of this kind are commonly used in casting the blanks for shrapnel nose bushing forgings. The mixture is copper 58, zinc 40, lead 2 and a small amount of aluminum or other deoxidizer. The lead is added to facilitate machining. This alloy forged should have 60,000 tensile strength and as cast it should be much in excess of 30,000.—J. L. J. Problem 2,651.

STAMPING

Q.—We should be glad if you could give us a bronze or gunmetal alloy for hot stamping?

A.—Copper-tin alloys are not usually stamped hot, as they are so hard. The greater the percentage of tin the harder does the alloy become. Alloys of 5, 7 and 10 per cent. tin will stamp hot, if the copper and tin used are pure. Electrolytic copper must be used, and the purest commercial brands of tin. Stamping temperature should be 700°C. The alloys usually stamped hot vary between 55 and 60 per cent. copper, the remainder being zinc.—W. T. F. Problem 2,652.

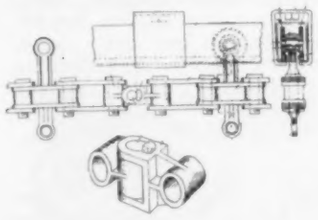
PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

The age of these patent notices is due to the delay in the issuing of patent reports.—Ed.

1,277,617. September 3, 1918. **Japanning-Conveyer.** J. E. McBride, Detroit, Michigan, assignor to Palmer-Bee Company, of the same place.

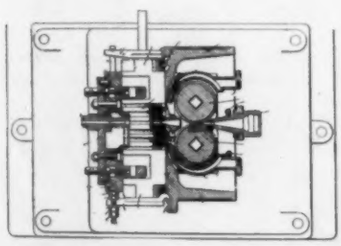
This invention relates to conveyers and is shown in the cut and described particularly in connection with a japanning conveyer, although the invention is not necessarily limited to the use mentioned.



Among the objects of the invention are to provide a continuously advancing chain conveyer or the like which is capable of movement in transverse planes; and especially to so construct and arrange the parts that a single chain construction can be employed for said purpose. The invention also resides in the assembly and details of the jointed link of the chain and in the novel mounting and arrangement of the chain and its supporting mechanism.

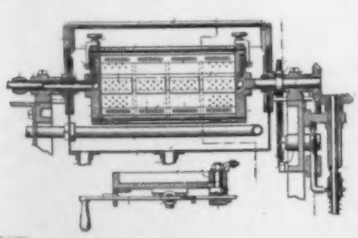
1,278,617. September 10, 1918. **Rolling-Mill.** Victor E. Edwards, of Worcester, Massachusetts, assignor to Morgan Construction Company, of Worcester, Massachusetts, a corporation of Massachusetts.

The present invention relates to a rolling mill and has particular reference to a construction, as shown in cut, employed for directing cooling water against the operating surfaces of the rolls of such a mill. The invention is here shown in connection with a construction embodying two stands of reducing rolls disposed in a single housing, the said construction being applicable to the method of rolling "rounds" fully set forth and described in Letters Patent of the United States No. 1,193,001, granted August 1, 1916; but it is to be understood that the invention is applicable to any and all types of reducing rolls and is not confined in any sense to employment with rolls disposed in stands such as herein shown and described.



1,278,501. September 10, 1918. **Machine for Polishing, Cleaning and Rinsing Metal Ware.** Anthony Peron, New York, N. Y.

This invention pertains to means whereby metal ware, such as silver and silver plate, may be washed and cleaned, polished, rinsed and dried for all practical purposes, the same being useful more particularly by hotels and restaurants the conduct of which business enterprises usually requires and demands the daily handling of the so called "table silver" in large quantities.

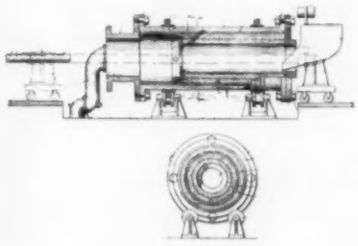


According to this invention, the several operations are performed quickly and economically, said operation being conducted, preferably, within one and the same chamber. Means are provided for feeding the required soapy water to the chamber; other means are provided for feeding a hot rinsing liquid to the chamber, and still other means are employed for mechanically agitating the metal ware in a manner to clean and polish the same.

Other features and advantages of the invention will appear from the drawing here shown.

1,279,399. September 17, 1918. **Process of Treating, Molding and Casting Metals.** William H. Millspaugh, of Sandusky, Ohio, assignor to Sandusky Foundry & Machine Company, of Sandusky, Ohio, a corporation of Ohio.

This invention relates to the casting of metals, and particularly to such processes as involve the pouring of the molten metal into a rotating mold.



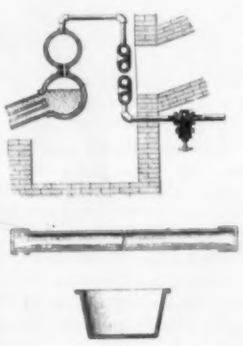
The inventor says:

One object of the invention is to provide a relatively simple and improved process of the aforesaid character by which a superior casting such as is capable of withstanding very high internal pressures and suitable for gun barrels and the like, may be produced.

According to my present invention, I pour the molten metal into a hollow cylindrical rotating mold and permit the metal to cool slightly before proceeding with the subsequent treatment. The next step in the process consists in introducing water in the form of spray or steam for the purpose of chiling the interior surface and forming a crust. Finally, the introduction of water is discontinued and a powerful blast of air directed through the hollow casting in process of formation. This blast of air is continued until the casting is completely cooled and set.

1,280,268. October 1, 1918. **Corrosion-Resisting Metal Article and Method for Making Same.** William J. Merten, Pittsburgh, Pa., assignor to George D. Breck, of Cleveland, Ohio.

This invention relates to a method of treating certain articles of iron or steel whereby their resistance to corrosion or oxidation by the action of different adverse agencies acting upon their respective surfaces may be augmented; and also relates to and includes certain articles and types of articles so treated and in which the invention is embodied.

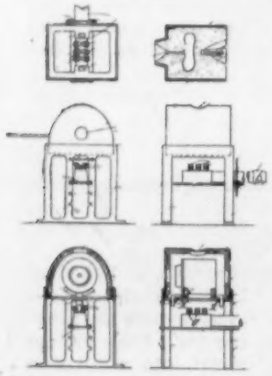


As a further description of a preferred embodiment of the invention, and assuming to treat a tube that is to be subjected to inside moisture and outside fire, that it is desired the inventor first removes all scale and other foreign matter from the tube, both inside and outside, place therein the necessary quantity of zinc dust, aluminum dust, copper filings or other suitable metal or alloy, close the ends, and raise the whole to a low red heat, under oxidizing conditions, subsequently cooling slowly in a non-hydrating atmosphere. The desired production of magnetic oxid on the exterior of the tube takes place at ap-

proximately the same temperature as does the adherent zinc-iron (or other alloy) coating on the interior, and both coatings will be permanent under all normal conditions of use.

1,280,631. October 8, 1918. **Device for Heating Metal Casting Molds.** A. C. Atkinson, Wellington, New Zealand.

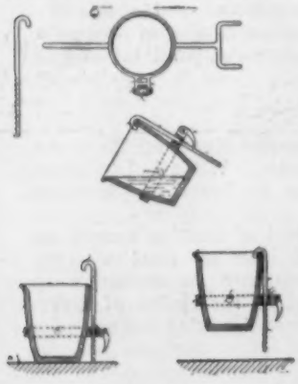
This invention has been designed in order to provide improvements in the heating of the molds, as shown in cut, used for casting small metal articles, and particularly used for casting artificial dentures and other dental work. These molds are formed by positioning a fusible wax model or pattern of the article to be cast in a metal flask and surrounding it with an investment of plaster of Paris composition. This model is then heated to melt the model so that the material of which it is composed will disappear and leave a mold of corresponding shape into which the metal is run to form the casting the mold being heated to insure of the proper running of the molten metal under the pressure usually employed in this class of casting.



In the operation of this process, it is advisable that the mold should first be slowly heated to melt the fusible model or pattern and to expel the moisture from the investment material, as its subjection to a quick heat renders it liable to uneven drying and consequently the destruction or distorting of the mold. After the moisture has been expelled the heat may be raised to heat the mold to the necessary degree to provide for the effective running of the metal.

1,280,712. October 8, 1918. **Crucible Holding Apparatus.** C. J. Goehringer, Cincinnati, Ohio.

This invention relates to improvements in crucible holding apparatus. One of its objects is to provide a simple, reliable and practical crucible holder. Another object is to provide for the automatic grip and automatic release of the hold upon the crucible. Another object is to provide for holding crucibles of different dimensions. Another object is to provide against accidental release of the crucible during the pouring operation. The invention also comprises certain details of form, combination, and arrangement, all of which is shown in the accompanying drawings, in which:



The patent covers:

Crucible holding apparatus comprising a member to support the weight of a crucible having a guiding recess and a gravity actuated pawl, and a holding member to engage the rim of a crucible having a shank guided by said recess and a rack to be engaged by said pawl.

Crucible holding apparatus comprising an annular member to support the weight of a crucible provided with handles to guide the crucible in pouring, a guiding recess and pawl carried by said annular supporting member, and a member to engage the rim of the crucible having a shank projecting below the bottom of the crucible and provided with a rack to be engaged by said pawl.

1,280,706. October 8, 1918. **Aluminum Alloy and Process of Making Same.** L. S. Gardner, Detroit, Michigan.

While aluminum alloys have many very desirable characteristics, they possess but little tensile strength, are brittle, cannot be bent, and present a ragged surface when machined unless operated upon slowly and carefully. Many efforts have been made to produce an aluminum alloy which will be free from these defects but, so far with but little success.

The object of the present invention is to produce an aluminum alloy which shall retain all of the good characteristics of aluminum and be practically free from the defects heretofore enumerated.

The formula (including zinc) which has been found to give the best results comprises the following metals in approximately the proportions given, the proportions being by weight: aluminum 78, tin 10, copper 4, zinc 8, manganese .05, and iron .07.

The alloy is made as follows: first a metal composed of aluminum, 5 parts, manganese bronze, 7 parts, and zinc, 6 parts is produced; the manganese bronze containing about fifty per cent. of copper and forty per cent of zinc; and the final alloy is then produced by mixing together aluminum, tin, and this preliminary composition metal in approximately the proportions, by weight, aluminum, 73, tin, 9, and the composition metal 18.

1,280,905. October 8, 1918. **Composition of Matter for Use As a Soldering Flux.** Augustus H. Van Marter, Flemington, N. J.

This invention relates to a composition of matter for use as a flux in soldering aluminum, one of the objects of the invention being to provide a flux which can be sprinkled onto the work in the form of a powder and which will cause the solder when applied to the aluminum surface to combine therewith and form a strong connection between the parts.

With the foregoing and other objects in view the invention consists of the following ingredients in the proportions stated:

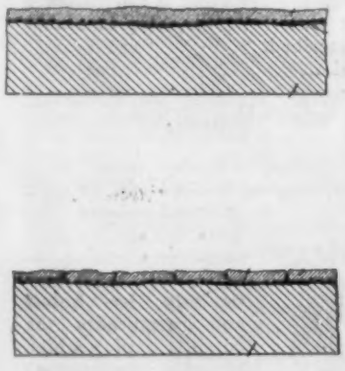
Stearic acid	16 oz.
Borax	2 oz.
Rosin	2 oz.
Pulverized cinnamon bark	5 oz.

In compounding the mixture, the several parts are thoroughly mixed together and produce a powder which can be sprinkled readily onto the work.

The solder used in connection wtih the flux preferably consists of a mixture of block tin, 16 ounces, and zinc, 5 ounces.

1,281,108. October 8, 1918. **Process of Coating Metals, Alloys or Other Materials with Protective Coats of Metals or Alloys.** F. A. Vaughn, Milwaukee, Wis.

The invention relates to a process of coating metals, alloys or other material with a protective or ornamental coating or coatings of metals or alloys.



One of the objects of this invention is to provide a process of coating materials, as shown in cut, with a metallic coating, more particularly of the non-corrosive varieties, in order to protect such materials from the elements or other destructive chemical and physical agents.

Another object of the invention is to provide a process of coating metals or alloys with a coating of metals or alloys which are dissimilar from the metals or alloys to be coated by interposing a coating of electrolytic insulating material between the metal and its metallic coating to prevent electrolytic action between the dissimilar metals.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

NATIONAL ALTERNATING ROTATING PLATING BARREL

That the belief of the National Galvanizing and Plating Equipment Corporation, 52 Broadway, New York City, that they had several years ago produced an efficient and economical plating barrel was justified is proved by the accompanying cut, Fig. 1. This plating barrel, which was the result of long investigation and experimentation, is here seen as a part of the regular equipment of the A. A. Brunnell Company of Worcester, Mass. This company at the start was impressed with the features of the National Alternating Rotating Plating Barrel and installed one on trial. The results of this test were so satisfactory that a number of barrels were added to the plant, and the company stated in a recent letter that "They found that so many articles could be plated in these barrels that they had thereby increased their output from fifty to a hundred per cent."

VIEW OF INSTALLATION OF PLATING BARRELS MADE BY THE NATIONAL GALVANIZING AND PLATING EQUIPMENT CORPORATION AT THE PLANT OF A. A. BRUNNELL COMPANY, WORCESTER, MASS.

It will, we are sure, be of interest to plating barrel users to know some of the salient features of the National barrel, which caused the Brunnell company to make this selection.

The first point that the manufacturers of this barrel bring to our attention is the fact that the plating or business part of the barrel is entirely submerged in the electro-plating solution. This, the manufacturers state, enables the operator to plate double the quantity of work possible in a partly submerged barrel. Furthermore, the barrel can be emptied in one and a half minutes, which is considerably less than is possible with other types. The fully submerged barrel can be completely emptied of work, thus insuring more uniform plating and also there is afforded increased output, solution volume and anode surface.

The second point of superiority and the one from which the barrel takes its name is that of alternate rotation. This means that the barrel rotates alternately; there are eight revolutions forward and eight reverse, and accomplished automatically. It can be readily appreciated, then, what it means when it is stated that "This automatic reciprocal rotation insures even exposure of every article in the barrel to the plating elements and thereby effects heavier, brighter and absolutely uniform coatings in less time than is possible in a barrel without this motion. Also anodes wear evenly on both sides of the barrel."

Its further advantage lies in the effect that this reciprocal rotation has on the plating solution itself. The gentle agitation accomplishes results in the free circulation of the solution immediately surrounding articles within the barrel and prevents the solution from becoming impoverished, pocketed or stagnant. Again, the circulation of the solution around the anodes allows them to decompose freely. These results cannot be accomplished by rotating a barrel in one direction in the ordinary way.

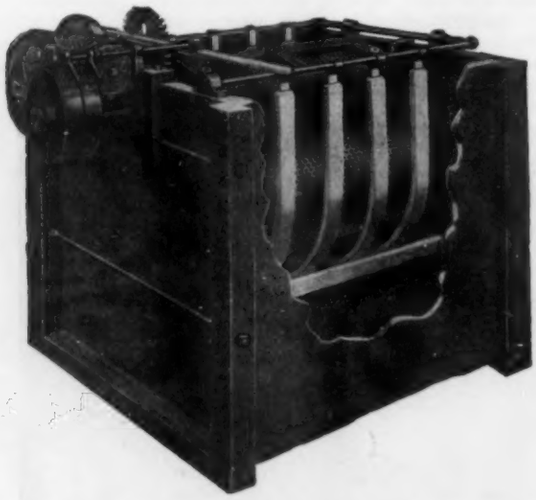
AUTOMATIC CUTOUT SWITCH.

The automatic cutout switch with which all barrels are provided is a simple contrivance permanently fixed to the disen-

gaging lever and provides the means for automatically and simultaneously breaking the electrical circuit when the barrel is stopped to empty and again closes the circuit when it is started after being filled with articles. This feature effects saving of current during the interval of charge and discharge. Further, as it prevents unnecessary coating of the conductors it avoids the necessity of constant cleaning and, more important, insures maximum electrical efficiency (conductivity) at all times.

CATHODE CONDUCTORS.

The electrical conductors within the barrel are of the stationary type designed to act as agitators for the articles during the process of plating. Being imbedded in the work, resting directly



A BELT DRIVEN NATIONAL ALTERNATING ROTATING PLATING BARREL.

thereon, it insures of the full current being transmitted directly to the articles themselves. The conductors are easily accessible for removal by simply loosening three bolts, without dissembling or disturbing the barrel itself. It is said that without exception it is the most practical and simple arrangement that can be found in any of the several types of barrels at present in use.

MOTOR OR PULLEY DRIVE.

Particular attention is directed to the choice of drive with which the National Alternating Rotating Plating Barrel is equipped. It is furnished with a motor attached for direct and alternating current or arranged for pulley drive. Both are equally effective in results. The entire mechanism except motor and pulleys is disposed underneath a hood, on top of driving side of plating tank and controlled by a single lever. With pulley drive arrangement the apparatus can be driven direct from high or low-speed shaft.

SHAFT AND STUFFING BOXES.

The center barrel shaft and stuffing boxes found in most plating barrels have been eliminated in the National barrel. A shaft is not required as an intermediate means for conveying current into the barrel and the barrel is of such substantial construction as to make its use unnecessary. The need of stuffing boxes in the tank is avoided by disposing the driving mechanism on top of plating tank.

It is stated that these barrels are built of the best possible material and with the best workmanship in order to ensure the long life found in these National products.

These barrels are built in two standard sizes, No. 1 holding 140 gallons of solution and No. 2 holding 187 gallons. There are also two types, one driven by belt as shown in Fig. 2 and one motor driven, which is exactly similar in every other detail. Further information will be found regarding these barrels in Bulletin No. 11, to be had upon request.

CRUCIBLES THAT SATISFY

The Joseph Dixon Crucible Company of Jersey City, N. J., have issued the following information relating to their crucibles:

"There is no lengthy statement needed in the matter of Dixon's crucibles. The Dixon crucible is looked upon as the standard of its line. Users of Dixon's crucibles are assured of an absolutely reliable investment. The Dixon crucible is guaranteed to be made of the very best materials obtainable. These materials are chosen and worked into crucibles by skilled, experienced men.

"They offer the Dixon crucible strictly upon its merits and urgently request very careful attention to what they have said in their pamphlets and circulars relative to the care and treatment of a crucible before using and while in use and even after the running of the first heats.

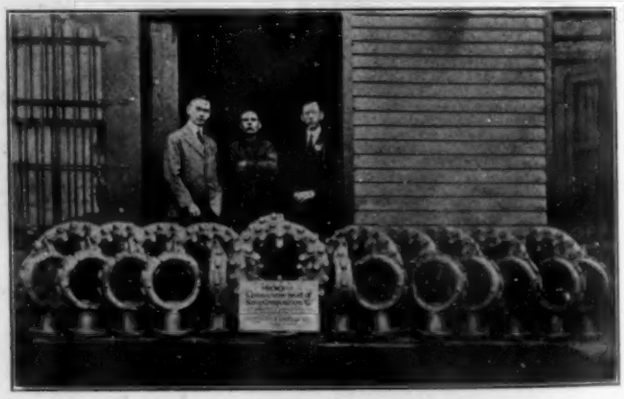
"In all of their descriptive and printed matter, they have sought to be careful and exact. They do not countenance the employment of misleading statements either in their printed matter or by their salesmen, nor do they enlarge upon the description of unimportant features with a view to influencing prospective buyers.

"Their policy is to make the Dixon crucible first-class in every detail, to provide their customers with a substantial, practical crucible that will meet every want for which that crucible is intended; but they desire to emphasize the fact that a brass crucible is not suitable for steel melting and that a crucible intended for a coal or coke fire may not prove serviceable in an oil or gas fire.

"They believe that the Dixon crucibles are the most economical crucibles in fuel consumption and in life if given the attention they suggest. Bear in mind that first cost is not the most important consideration. Value in all goods is dependent upon the quality of material and workmanship employed, and a standard product like the Dixon crucible, if perhaps a trifle more costly, is invariably found the most satisfactory and the most economical in the end."

A RECORD ON COMPOSITION "G"

The casting, as shown in the accompanying picture, represents a part only of a remarkable achievement lately accomplished in the foundry of E. A. Williams & Son, Inc., Jersey City, N. J. The castings shown in the cut represent the four hundredth consecutive heat passed by Government inspectors on a Government contract. At the time the picture was taken 200,000 pounds of castings made to Government specifications had been passed as O. K. by the inspector without a single rejection. This constitutes a record which, according to the Government, is almost unequaled. The alloy used in making these castings was



THE 400 CONSECUTIVE HEAT OF COMPOSITION "G" CASTINGS AT PLANT OF E. A. WILLIAMS & SON, INC., JERSEY CITY, N. J.

Composition "G" of the Navy Department and the castings were made subject to the specifications as given in 46M6a, which provides for physical and hydrostatic tests as well as chemical analysis. The chemical characteristics as called for by the specifications are as follows: Copper, 87 to 89; tin, 9 to 11; zinc, 1 to 3; iron—maximum, .06; lead, .20. The physical properties must be as follows: Minimum tensile strength, 30,000 pounds per square inch; minimum yield point, 15,000 pounds.

SECOND ANNUAL BANQUET OF PROVIDENCE BRANCH AMERICAN ELECTRO-PLATERS' SOCIETY, HELD IN PROVIDENCE, R. I., DECEMBER 7, 1918.

More than 150 members of Providence Branch of the American Electro-Platers' Society with a number of guests and friends gathered at the Narragansett Hotel Saturday evening, December 7, 1918, for the holding of the second annual banquet. The occasion was one that will linger long in the memories of those in attendance and the outcome is certain to accrue to the benefit of the local branch.

The dinner, which occurred at 7:30 o'clock, was preceded by an informal reception in the parlors, the officers and members of the banquet committee being on hand as early as 4 o'clock to welcome members and guests as they arrived, and everything possible was done to make everybody at ease, and in this, as in the entire program, the association was eminently successful.

Seated at the head table were President George Weigand, Honorary President Arthur W. Claflin, of George L. Claflin Company; Dr. William Blum, Ph. D., Chemist of the Bureau of Standards, Washington, D. C.; Charles H. Proctor, of Roessler & Hasslacher Chemical Company, New York; W. J. Schneider, Chairman of the Executive Committee of the New York Branch, A. E. S.; Frederick J. Liscomb, of Chicago Branch, A. E. S., and a member of the Bureau of Standards, Washington; Henry Wolcott, of the Wolcott Mfg Company and President of the New England Manufacturing Jewelers' and Silversmiths' Association; Edgar C. Lakey, with B. A. Ballou & Company, Inc.; William H. Mason, THE METAL INDUSTRY, and officers of the Association.

The members and individual guests were arranged a tete-a-tete at small tables, and after an excellent chicken dinner the exercises were opened by President George Weigand, who delivered an address of welcome and then introduced the speakers. These included Professor A. W. Claflin, Dr. Blum and Charles H. Proctor, the founder of the Society. The speakers all congratulated the Providence Branch for the great work it had done, and then touched generally upon the conditions that would have to be faced now that the war had ended. They also declared that a great future was in store for the electro-plating industry and that the American Electro-Platers' Society had a great deal of work before it.

Toastmaster Claflin then read a telegram from Supreme Secretary Oscar E. Servis, of Chicago, of greeting and congratulations at the success of the local branch and best wishes for the future. He also read an interesting letter of congratulation from Supreme President Walter Fraine, of Dayton, O.

Other speakers were Frederick J. Liscomb, of the Bureau of Standards, at Washington, D. C., who brought a message from Chicago Branch; F. Davell, of Bridgeport (Conn.) Branch; Henry Wolcott, President of the New England Manufacturing Jewelers' and Silversmiths' Association and W. J. Schneider, of the New York branch.

Readings by William Shean; songs by Walter Smith; violin solos by Edwin Maker and Carlton J. Poynton, and piano selections by G. F. Thayer interspersed the speaking and were warmly applauded. During the evening acceptable souvenirs in the shape of a soldier's sombrero for a paper weight were distributed by S. Herrick, representing the Celluloid Zapon Company, New Haven, Conn.

The banquet committee included Gavin J. Tyndall (chairman), John McDonough, Harry Greene, John E. Garrick, Harry Scholes, Carlton J. Poynton and John H. Andrews. Hugh McGuinness had charge of the musical program. The officers of Providence Branch of the American Electro-Platers' Society are President—George Weigand; Vice-President—John H. Andrews; Secretary-Treasurer—Albert J. Lemrise; Sergeant-at-Arms—Harry Scholes; Librarian—Frederick Grant and Laboratory Chairman—Harry Greene.—W. H. M.

PERSONALS

ITEMS OF INDIVIDUAL INTEREST

Hugh J. Pritchard was elected President of the National Conduit and Cable Company yesterday to fill the vacancy caused by the death of **George J. Jackson,** and **G. H. Hawley,** who has been connected with the Ansonia Brass and Copper Company, was elected a Vice President of the cable company in charge of manufacture. It was said that the outlook for new business was favorable.

Andrew M. Fairlie, consulting chemical engineer, announces the opening of an office for general consulting practice at 1204 Third National Bank Building, Atlanta, Ga. Mr. Fairlie, who has been for several years chemical engineer for the Tennessee Copper Company, is still retained by that company in a consulting capacity. Many of THE METAL INDUSTRY readers will remember the interesting articles that he wrote for this journal, particularly those relating to the production and recovery of copper.

Sergeant Frank C. Rushton, of St. Louis, Mo., who was attached to the 138th Infantry Regiment, reports in a letter received November 2 that a machine gun bullet entered his right shoulder and pierced the collarbone and left the right arm partially paralyzed. He stated that he was improving every day and hoped soon to be well enough to return to duty. Sergeant Rushton was wounded on September 26, at the start of the big Verdun drive, after which it took 1,450 new men to replace the losses of his regiment. A brief description of Sergeant Rushton's career together with his photograph was published in the March, 1918 issue of THE METAL INDUSTRY. Sergeant Rushton is an active member of the American Electro-Platers' Society, St. Louis Branch.

DEATHS

JOHN CALHOUN

John Calhoun, for 27 years employed in the main office of the Coe Brass Branch, American Brass Company, died suddenly November 19 of apoplexy at his home, 44 Cook street, Torrington, Conn. He had been stricken the previous day while engaged at his duties at the office, when fellow workers found him lying unconscious across his desk.

Mr. Calhoun was born in Torrington, March 7, 1864, and attended the public schools there and the Morgan school at Clinton, Conn. His first employment was with the Union Hardware Company, of which his father, Judge Joseph F. Calhoun, was secretary and general manager. In December, 1885, he entered the employ of the Coe Brass Company and remained with that organization until his death.

Mr. Calhoun was a member of the Torrington Club, Seneca Lodge F. & A M.; Cyrus Chapter, R. A. M.; Clark Commandery, K. T., and the Sons of the American Revolution.

He is survived by a widow, a son and a daughter.

CHARLES E. RYBERG

Charles Edgar Ryberg, sales agent in charge of the department of brass and bronze, of the Bethlehem Steel Company, South Bethlehem, Pa., succumbed to pneumonia, superinduced by influenza, October 25, at his late home 301 East Goepp street, Bethlehem, Pa., aged 51 years, one month and four days. He was born in Brooklyn, N. Y., on September 20, 1867. Mr. Ryberg leaves his wife and three sons, Charles in the National service at State College and Edward and LeRoy at home. Interment was made at Brooklyn, N. Y.

JOHN CALHOUN.

SHERMAN BOUGHER, WHOSE DEATH WAS RECORDED IN THE METAL INDUSTRY FOR NOVEMBER

CHARLES E. RYBERG.

Professor Pierre de Peyster Ricketts, head of Ricketts, Inc., mineralogical and mining engineers with offices at 280 Madison avenue, New York, died at his home, 115 East Seventy-ninth street, November 20. He was 71 years old. Mr. Ricketts was born in Brooklyn and was graduated from Columbia University in 1871. He served as assayist and analytical chemist at the university for thirty-four years. He was also author of several books on assaying.

Arvid Dayton, 55, whose father was one of the pioneer manufacturers of Torrington, Conn., died November 17 at Middletown, this state. His father for many years conducted a reed organ factory here, the first of its kind in the country. One of his brothers was William H. Dayton, who was for many years prominently identified with the Excelsior Needle Company.

Lieutenant Lawrence W. Hutchinson, son of Senator Barton B. Hutchinson, died of pneumonia while in the service overseas. He was connected with the Copper Engineering Company, Trenton, N. J., following his graduation from Princeton University. He was a member of the Campus Club of Princeton.—C. A. L.

Dr. Gustav G. Zeller, president of the Egyptian Lacquering Manufacturing Company, New York, died at his home at 595 West End avenue, New York, on November 23.

TRADE NEWS

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

WATERBURY, CONN.

DECEMBER 9, 1918.

Waterbury is adjusting itself to peace time conditions with less disturbance than other munitions centers of Connecticut. While plants in New Haven and Bridgeport within a few days after the announcement of the signing of the armistice had begun to let employees go, the plants in this city have thus far been keeping practically all employes at work. Two or three characteristics of the manufacturing plants in this city are responsible for this contrast.

First of all there is the fact that brass is a basic product. The mills that have been producing brass are able to swing from war production to peace production, even in anticipation of coming orders, on certain lines in a way that cannot be done by plants that are turning out specialized manufactures for either war or peace work. It does not take the readjustment of machinery that many factories that have been turning out war orders are now in process of undergoing or will be in process of undergoing just as soon as there begin to be poured into them new business under the readjustment.

Far seeing brass manufacturers here realize that very shortly they will be flooded with orders for certain standard articles in the brass line, and they are able to get a start on some of this work even before orders begin to come in. Just one instance of this is in the automobile industry which calls for brass and which has been cut off from production for nearly a year, and which has already begun to send in its orders.

Another thing that has brought relief is the fact that all plants here were very short of employees because of the constant drain that had been made upon them by the drafts and voluntary enlistments. As for the latter it has been noted that there was an ever increasing enthusiasm on the part of young men working in plants that were turning out shells or other munitions to get over into the fighting where their shells were doing such effective work. It was the imaginative appeal that came to the young men, who were not content simply to keep shells moving to the front, but wanted to get out where the shells were going. The result was a great shortage of workers. This shortage became so acute that the Government sent some 1,500 limited service men from Camp Devens and other army cantonments, assigning them under military orders to work in the war production plants of this city.

Already a beginning has been made of demobilizing these men with the natural result of relieving the factories of many workers who were thus imported from other parts of the country. This reduces the numbers without any factory actually having to lay men or women off from jobs at which they have been busy.

Another characteristic of Waterbury plants is standing them in good stead in this trying period of re-adjustment. Perhaps the Scovill Manufacturing Company's plant best illustrates this. It is a typical Yankee "Jack-of-All-Trades" factory. It can make anything. It can turn itself over in a night, changing from the manufacture of one article to the manufacture of another. Its whole history has been one of sudden changes to meet new demands. It is not disturbed as much as the ordinary plant by the necessity of dropping what it is doing and swinging to another line. Its managers have been looking to the ending of the war and have wisely been feeling their way to the taking of peace time orders, not only in our own country, but particularly in South America.

The Scovill plant is the largest in the city, having shown the greatest growth since the war. It had reached the maximum at the coming of peace. The plant then had somewhat over 14,000 employees and was doing 100 per cent. war work or very nearly that. It was busily engaged upon some $12,000,000 or more of unfinished war orders placed by the Government when the end came. This will give some idea of the heavy and complicated problems of re-adjustment that face some of the big plants that have turned their efforts so strongly toward filling Government demands for the shells and other munitions that were so necessary to the defeating of the enemy.

There has been a hitch of disagreement between the United States Housing Corporation and the city government over the plumbing work that is to be done in the 200 or more dwellings which are being put up in this city under government supervision for workers. While none of the houses have yet been completed, the clearing of one tract on which the proposed half million is to be spent has been well pushed along and cellars of very many have already been completed. The government has decided not to develop one tract, known as the Sylvan-avenue tract, on which work had not yet been started. It was decided that the ending of the war would not call for as extensive a development as had at first been projected.

The row over the question of plumbing comes of the fact that in some details the proposed work does not conform with city ordinances regulating this work. At this writing the city fathers are thrashing over the question of whether or not the government should be given special permission to go ahead with the work in its own way. It is argued that since Boston and other cities of careful management in which the government has built houses under special act of congress for the providing of homes for war workers have permitted the government to put in the same plumbing proposed for this city, the work cannot be so bad as to call for its exclusion here. Because the war has ended, it is feared by some that if a loop-hole is thus provided the government will quickly avail itself of the opportunity thus offered to withdraw from housing work here and the city thus lose 200 dwellings that it is badly in need of.

It may be said in closing that employees here are less restless than they appear to be in other manufacturing cities of New England. Just because they have not been subjected to daily reports of workers turned away from the factory gates as a result of the ending of the war, they feel more settled. Not that they have no question of what may come. There is a notable tendency for men to stick closer to their jobs, a tendency that is not to be explained entirely by the fact that the United States employment service is still in operation.—E. R. S.

TORRINGTON, CONN.

DECEMBER 9, 1918.

The cancellation of contracts for war supplies has necessitated the laying off of approximately 400 workers in Torrington. About half of these are women. All overtime work, of course, has been suspended.

Just prior to the signing of the armistice, 90 per cent of the total output of all the factories of Torrington was war supplies. With the cessation of hostilities and the consequent cancellation of government contracts Torrington manufacturers were faced by one of the biggest problems they have ever been called upon to solve. Every factory was being operated to the maximum of its capacity and every energy was being devoted to war work. Tools and machinery used in manufacturing so-called non-essentials had been replaced in many of the shops by tools and machinery for turning out munitions. These could not be changed about over-night. Furthermore there was no great stock of materials on hand to be used for making non-essentials. Most of it was of the gauge and width required for war stuff. And even if it were possible to make the quick transition, wholesalers, on the eve of their December inventory-taking, were not anxious to stock up. Then again, many of the salesmen were in service or were working inside the shops; but in any event they could not be sent out on the road owing to the uncertainty of the prices of products. This uncertainty would make it inadvisable to manufacture large factory stocks to be held for a market. It was, and still is, a big problem, but Torrington manufacturers are meeting it as effi-

ciently as possible. In this they are being aided by the United States employment service. John H. Lancaster, director of the service for this district, sent the following letter to all employers during the latter part of November:

"Until the signing of the armistice, the functions of the community labor board and the United States employment service were mainly to supply your needs for labor in order that you might keep your war work output up to the maximum. We shall strive to continue to be of service to you in the same way, but the situation is practically reversed.

"Formerly there were more jobs than men. Now there are, or shortly will be, more men than jobs. We are in accord with you on the proposition that the best men in every instance should be retained and that the poor workmen should be the first to go. We believe that you will be in accord with us on the proposition that it will be to the best interests of all communities to place men in new positions as fast as they are laid off from the old, to the end that there shall not be in any community at one time a considerable number of men out of work. Trouble of one kind or another always results where congregation of unemployed occurs.

"If you could give our office a few days' notice when you are contemplating laying off any considerable number of your employes, and the number and kind of work these employes are fitted to do, we can compare other employers' requisitions in the county with the list you intend to lay off, and in many instances be in a position to place these men at once after they leave your employ.

"Such information along this line as you shall seee fit to give us will, of course, be considered as strictly confidential by this board and by the United States employment service office."

Similar letters have been sent to all the manufacturers in Winsted, that town having recently been added to the jurisdiction of the district office here.

The Coe Brass Branch of the American Brass Company, Torrington's largest plant, has been able to effect the change to a peace basis without necessitating the laying off of any large body of employes. The nature of the products manufactured at this plant, of course, tended to facilitate the transition.

The soldiers recently sent to the brass plant from Camps Devens and Upton are expecting to receive their discharges at any time. Most of them, it is understood, will return to their home towns.

The manufacturers as a body have not yet taken any definite action concerning the placing of men returning from service, but it is generally understood that those whose work was satisfactory will be given their old jobs insofar as is possible.

Through the assistance of the federal employment service, a number of laborers, whose services were no longer needed in the shops, have been placed on farms.

Torrington manufacturers are now getting all the bituminous coal they want, but it is difficult to get shipments of anthracite. Bituminous coal is from 10 to 15 cents per ton cheaper than it was two or three months ago.

F. L. Braman, vice-president of the American Brass Company, was re-elected treasurer of the Litchfield County Y. M. C. A. at the convention held in Litchfield, November 23. Other officers are: President, John M. Wadhams, of Torrington, and vice-presidents, F. B. Jones, of New Hartford, and John E. Calhoun, of Cornwall.

The lid was pried off in Torrington when the news of the armistice signing was received. There celebration began with a big parade and demonstration early Monday morning, November 11, and continued intermittently throughout the week. The shops were closed for a day and a half.

A large number of Torrington men are in the 26th Division, which has been designated as a unit of the army of occupation.

Revised figures on the influenza epidemic in Torrington show a total of 3,450 cases with 86 deaths. The emergency hospital in the high school building was not closed until the middle of November.

The Torrington War Chest subscribed $60,000 to the United War Work fund. This was $10,000 in excess of the quota for the town.—J. H. T.

NEW BRITAIN, CONN.

DECEMBER 9, 1918.

At this writing none of the war contracts that have been given to local manufacturing concerns have been cancelled, according to statements made by officials, but at the same time the signing of the armistice and the prospects of an early peace is having a material affect upon the factories in this city. The New Britain Machine Company, which has probably handled more big ordnance contracts for the Government than any other local concern, is the first to be affected. H. H. Pease, treasurer of the company, states that the Government has issued an order to his concern informing him that the cessation of hostilities has made it unnecessary to hasten the production of ordnance work, hence, all further night work is to be discontinued. The machine company, however, is making every effort to retain its employees and so distribute the work that the least possible number will suffer because of Government restrictions. To this end, men employed on the night shift have been given an opportunity to apply for day work and as many as possible will be accommodated. Changes in the working hours at the machine company affect about 1,600 employees. In some cases the change in schedule will cut the pay of workmen almost in half. This is particularly true of those who worked on the 13-hour shift and received regular pay for eight hours and overtime for the extra five hours. Treasurer Pease adds that no cancellations of Government orders have been received and none is expected. The Government has issued orders that all contracts for gun carriages, which has been one of the main outputs of the local concern recently, shall be completed.

At the Traut & Hine Manufacturing Company, also engaged in Government work, all Sunday work has been stopped, as has night work, and the old schedule of 55 hours per week is again in effect. Between 80 and 90 per cent. of the work done recently at this concern has been for the Government, and, as yet, no cancellations have been received. Similar reports are received from the North & Judd Manufacturing Company, another concern doing much Government work. At the Landers, Frary & Clark factory the coming of peace is expected to make but very little material difference in business. Although the concern has been engaged almost exclusively in Government work, it will be very easy to return to domestic production again. This factory has turned out enormous quantities of cutlery, bayonets, mess-kits and other army accoutrements, and at the time of the signing of the armistice most of these orders were almost filled. The factory officials are awaiting further developments in the industrial world, but are confident that with peace conditions their vast organization can again take up its peaceful pursuits. Cutlery of all descriptions and all sorts of household utensils are made here, and during the rush of war work the domestic production has fallen down badly. It will take some time to catch up with home orders.

At all of the other concerns similar conditions exist. Naturally there is a certain feeling of uncertainty among the employers as well as the employees, but those who should know are expressing but little real concern. The period of reconstructions abroad should open up enormous channels for the consumption of New Britain made hardware, and in addition to this, the South American trade is being developed, so that with these sources of business, in addition to the increased American trade that is almost sure to follow the war, the captains of industry are standing pat and letting the factories of the "war-time mushroom variety" do the worrying.—H. R. J.

ROCHESTER, N. Y.

DECEMBER 9, 1918.

The situation among the big manufacturing industries in Rochester is a rather peculiar one at this particular time. The cessation of hostilities, together with the cancelling of Government contracts in all parts of the country, has tended to bring about a feeling of apprehension among the larger institutions in this city.

The feeling of uncertainty is so pronounced that for some time past the heads of some plants have been falling back upon

ante-war plans, the development of which was begun months ago in anticipation of an early ending of the conflict in Europe. It is pleasant news, therefore, to learn that many of Rochester's industries, such as the Bausch & Lomb Optical Company, the Eastman Kodak Company and others, have already begun to to look out for the regular business that they have enjoyed before America entered the great struggle.

The Bausch & Lomb plant, whose capacity was doubled since war was declared and whose big addition was finally gotten under complete headway about two months ago, has still another six-story building in course of completion to the north of the latest addition. It was said to-day that the company, which has devoted its entire energy to war work, will not dismiss one of its 6,500 employees. Although it is possible that some of the Government contracts will be cancelled and work stopped on other contracts, the company is prepared to employ every man and woman on regular standard lines. The company was making 85 per cent of all the material of its kind in the country for the Government. It neglected its domestic business completely. Now the time is nearly ripe to resume its original activity.

The same condition exists at the Eastman plants, although that concern did not devote its entire attention to war work.

There have been some cancellations of shell and gun contracts at the several Symington munition plants in the city, but it is reported that all contracts that were well along in process of filling will be continued. A large number of extra men have been laid off at the munition plants, and a gradual letdown is expected from now on until the war work stops entirely. Some difficulty is anticipated in the readjusting of the wage scales, and trouble may develop. The manufacturers hope not.

Shipping facilities have improved of late, due, possibly to a letting up in the handling of war materials.

That at least one of Rochester's big manufacturing concerns is now making practically all the raw materials which before the war it purchased in Germany, and that instead of cutting down the number of persons employed its intention is to add to the size of its plant and to furnish work for at least 500 additional employees, is shown by the statement of George Eastman, made in response to a question regarding business and financial conditions in this city after peace is finally declared.

Mr. Eastman, head of the Eastman Kodak Company, Rochester's largest employer of labor, said to-day:

"Beginning about four years ago, the industries of the country have increasingly devoted themselves to producing war materials, and for the last year practically everything has been subordinated to war work. During these years replacements have been postponed, public improvements have almost entirely ceased, and stocks of merchandise have been depleted.

"Why should there be a business depression when so much is needed? If there is such a depression it can come only through lack of confidence and lack of skill in the readjustment of industry from war to peace work. It rightly directed there ought to be work for everybody, including returned soldiers and the women who have entered industry and want to stay.

"It would help in taking up the slack during the readjustment period if the city would start every possible improvement it can borrow money to pay for. No doubt there will be some adjustments of wages. In the struggle to turn out war munitions some wages have been increased out of proportion. If all available labor is wisely utilized the things that people want will be produced in great abundance, so that the dollar will have increasing purchasing power, probably enough to offset wage readjustments.

"As to whether Rochester factories are in condition to meet readjustment to peace work when war orders are cancelled, I can speak only for the Eastman Kodak Company. If we can maintain supplies of all raw materials we have work for all our present employees, and as soon as we can obtain additional supplies, which we believe will be forthcoming soon, we can find work for at least 500 more.

"Our engineering force is already at work on plans for a number of new buildings, including one which will quadruple our production of gelatine, a material we formerly bought from Germany. In this connection I may say that the Kodak Company is now making practically all of the raw materials it formerly purchased from Germany."

Plans have been completed for the new structure, which will be 400 by 600 feet in dimension, with a three-storied center.—G. B. E.

CINCINNATI, OHIO

DECEMBER 9, 1918.

The end of the war, or, to be strictly accurate, the signing of the armistice which brought the end of hostilities, and, therefore, the virtual end of the war, brought the machine-tool and allied trades of Cincinnati up with a sudden and painful jerk. The extraordinary activity of these trades for several years past, due to a large extent to the insatiable demand for tools and machinery for the manufacture of guns and munitions, is, of course, well known. With the end of the war in sight, however, and with hostilities actually over, the demand for machinery for the manufacture of war material naturally came to an abrupt halt. As long as the United States and the Allied Governments had to look forward to a year or more of war, they had to provide themselves and their manufacturers with practically unlimited equipment for the continued production of the enormous quantities of shells, guns and other material required for the conduct of war on its present scale. With the need for this material at an end, however, with, undoubtedly, large reserve supplies of machines, as well as of guns and munitions laid by, the obvious course was to countermand at once orders for the delivery of more machinery; and this is being done as far as the contracts will permit. In most cases, however, the manufacturers are protected on work which they have actually started, and will not be compelled to accept a loss by having machinery specifically ordered thrown back on their hands. Their chief worry is as to future business, and on this point there is some uncertainty, although the underlying opinion is that after the period of readjustment now started has been passed there is not the slightest reason to believe that the trade will not secure its share of the enormous business, both foreign and domestic, which all economists and statesmen agree is ahead. Prospects for foreign business are also regarded as bright, inasmuch as American tools are used the world over, and there have been few available for the general market lately, for the reasons already pointed out.

Whether the Allied countries have on hand many tools ordered for war purposes, and now available for peaceful industries, is a question which will be difficult to answer. One prominent tool man stated that after the Russo-Japanese war, during which many tools were shipped abroad for the making of munitions, large shipments were left on the hands of the Governments importing them, without even having been uncrated. The attitude of virtually all Cincinnati concerns toward returning soldiers is that they are entitled to prompt re-employment at their old positions. The Wm. Powell Co., brass manufacturers, with 75 men in the service, of whom three have been killed, has indicated that it will gladly employ all who return; the D. T. Williams Valve Company, with 30 men in the service, will do likewise; the Cincinnati Milling Machine Company, one of the larger tool manufacturers, expects to employ all of its men who return from the Army, and many others, too numerous to mention, have indicated a similar policy. As far as Cincinnati and the metal trades are concerned, in other words, the problem of employing the returning soldiers, which has been worrying eminent men not a little, is no problem at all, for it has but one answer.—K. C. C.

CLEVELAND, OHIO

DECEMBER 9, 1918.

Preparations for peace time demand upon the metal industry in Northern Ohio already are under way at practically every plant in this district following the announcement of peace on November 11. The most significent factor in the altered industrial situation here, however, is the suddenness with which the turn was made from war to peace. All industry in the Cleveland district was set for a continuance of the war for another year at least, and their building expansion, equipment, and labor were augmented to meet that view. It is well to note, however, that the change back to peace had not altered so far any conditions that held during

the last few months of the war. Most metal industry plants here are still working on war orders, although these have been curtailed to a considerable degree already. It is upon the curtailment of its orders, and the rescinding of its contracts that the government will base normal or abnormal peace time conditions in the trade, according to a statement issued at the Aluminum Castings Company, a statement that voices the sentiment throughout the trade. This organization, it should be noted, depends largely upon the automobile trade for outlet for its product. Already the government has permitted the manufacture of cars 50 per cent. above that at the time restrictions were placed upon the automobile industry. Hardly a day passes that announcement of removal of restrictions on other trades reaches Cleveland; so by easy stages it seems the prediction of return to normal peace time requirements will hold good.

In its statement concerning the change from war to peace, for the benefit of its trade, the Aluminum Castings Company says:

"If the war department is not too abrupt in cancellation of its war orders, we can swing directly into peace time production. Up to this time we have had all the business we can handle, and the indications are good for the future. We look for the automobile business to get into line, although it may take that industry some time to swing over, depending upon how much disruption the makers suffer from their war work. This company has seen no need to cut its forces aside from cessation of night work. We believe two months at the outside should see manufacturing generally back to normal."

"These views are borne out largely by similar statements from the White Company, the Rubray Company, the Glenn L. Martin Airplane Company, the Standard Parts Company, the Willard Storage Battery Company, and scores of other institutions here that depend largely upon the metal industry for their materials.

Meanwhile building operations, hampered by the restrictions by the War Industries Board prior to declaration of peace, are continuing where started, showing that all organizations that required more room, equipment and manufacturing facilities believe they will need the new accommodations. Among the conspicuous examples of these operations is the construction of three units for the Aluminum Castings Company in the southeastern part of the city, one a foundry, the other a storage plant, and still another for finishing and shipping purposes, the completed structures giving this concern eleven buildings in its group. The latest operations are said to cost $500,000.

Although rumors of lay-offs in many plants have been rampant during the last week or so, there has been no confirmation of these reports so far. That the metal industry, and all business, must be stabilized through the steady employment of labor is recognized. That there is little ground up to the present for these rumors seems to be borne out by the announcement of the Cleveland Brass and Copper Mills Company that it normally should have 600 men and has only 350 at this time. Optimistic view of the immediate and more distant future is taken here as seen in the announcement that the building trades and automobile interests, now unrestricted in their operations to a large degree, will be in the market for large quantities of materials. It is admitted at the Cleveland Brass and Copper Mills Company, however, that little change can be expected in either of these two big consuming divisions before the first of the year. —C. C. C.

COLUMBUS, OHIO

DECEMBER 9, 1918.

The metal market in Columbus and central Ohio territory has been rather quiet since the signing of the armistice. Orders and inquiries are fewer as metal using concerns are slow in placing orders for the future. The managers feel that they will use surplus stocks of metals until they see what is going to happen. Reserve stocks are not very large, but will last for a month or six weeks as a rule.

Shipments are coming in very well as railroad congestion is not as bad as formerly. Prices are unchanged from the previous month. The metals fixed by the federal authorities are not changed and other metals are quiet, but no cutting of prices is reported. The market is in a state of expectancy, and, as a result, little is expected to develop for several weeks.

It is believed that some of the Columbus metal using concerns may suspend operations for a short time after finishing war contracts and before they start commercial work.

The Althoff Plating and Polishing Company, which is located at 324 North Sixth street, Columbus, is one of the concerns which have developed wonderfully during the period of the war. This concern has been in business for almost 40 years and, as a result, has a wide reputation among the people of central Ohio. The concern has a well equipped shop to do plating, brazing, oxidizing, welding, and many other processes. This company has been specializing in the manufacture of auto headlights, door hinges, and other automobile accessories.

Papers have been filed increasing the authorized capital of the Hoffman Bronze & Aluminum Company, of Cleveland, Ohio, from $30,000 to $75,000.

The capital of the Ryder Brass Foundry Company, of Bucyrus, Ohio, has been increased from $1,000 to $25,000.

The Ohio Metal Company, located at Fourth street and Fourth avenue, Columbus, has been developing rapidly since the concern has occupied its new building and foundry at that place. Henry Loeb is at the head of the concern.—J. W. L.

DETROIT, MICH.

DECEMBER 9, 1918.

The sudden ending of European hostilities has resulted in a great number of war contracts being cancelled in Detroit and the upstate cities. A great percentage of this work was being done by automobile companies and concerns engaged exclusively in the production of brass, copper and aluminum supplies. Within a week after the final surrender every automobile company in Detroit began cleaning up and re-arranging machinery for the production of pleasure cars which, to a large extent, had been discontinued. The Ford plant is now well along towards its production of 3,000 cars a day. The Cadillac, the Packard and the Dodge concerns also are rapidly shifting back into the old line.

Labor conditions still continue good here and most any one who wants to work has no trouble finding it. As soon as the fighting stopped there was a general scramble in labor ranks to get away from the munition plants and into stable work. Notwithstanding the shifting of labor there seems to be no great reduction in wages. There is but little doing in the munition plants now.

Women still are clinging to their jobs in the automobile plants, and it is just as common now to see them in overalls as it was a few weeks ago. Great many of them seem to be fitting into the automobile industry as readily as they did in the munition plants. Detroit, as a rule, has little to fear so far as manufacturing is concerned. Readjustment is progressing rapidly. Bankers and financial experts are looking in the near future for one of the greatest manufacturing booms Detroit has ever experienced. Living conditions are high with no prospects of a reduction.

Outside the automobile companies, the brass, copper and aluminum concerns are facing, for the time, a rather uncertain future. But as a rule, a great majority of these concerns are engaged more or less directly or indirectly in the production of automobile accessories or parts. They will be carried along by the automobile companies it is confidently felt, but outside this particular line it is hard to forecast their future.

There seems to be nothing doing at present in the way of manufacturing plumbing supplies or building hardware. It is too early yet to forecast the future of this branch of the metal trades. Manufacturers in this line, however, seem quite optimistic. They too are depending more or less on the manufacturing of automobile accessories and parts to fill in during the dull periods.—F. J. H.

LOUISVILLE, KY.

DECEMBER 8, 1918.

Peace came so unexpectedly that many of the industrial concerns were caught a little unprepared. As a result there has been a general tightening up noted all along the line.

Many large industrial concerns are slowing down rapidly as a result of cancellations of contracts for various sorts of army and naval supplies. A number of concerns have quit purchasing materials, supplies, coal, and everything that is not needed for immediate business, with the result that things are a little quiet just now. However, the brass and copper trade hasn't been affected as much to date as has been the case in many other lines.

At the time peace was declared a number of concerns in Louisville were working on war orders, principally copper tubes for installation in fast steaming torpedo boat destroyers, condensers, etc. Others had large contracts for metallic packing, and specialties of one kind or another. A considerable percentage of these contracts will be filled, as many vessels were already keeled, and will be completed. While the naval program stands to be cut somewhat, it is believed that a large percentage of the metal contracts now in the hands of local concerns will go through.

The outlook for 1919 is a little uncertain at the present time.

The one bright spot from the copperman's viewpoint is in the fact that machinery for better preservation of food is in constantly increasing demand. Milk machinery, fatty acid machinery, and machinery for distillation, and preservation of various kinds of foodstuffs, including refrigerating machinery, is in a constantly increasing demand.

It is felt that the coming year will bring about a great demand for American made machinery for use in Europe, including modern mining cars and equipment, railroad cars, locomotives, and general factory machinery. This will bring about a good demand for bearings, and special castings of various kinds.

The big question with the Louisville trade is whether or not European demand will reach as far inland as Louisville to any extent. While the European demand may not reach inland, it will to some extent result in Eastern Manufacturers being busy, resulting in there being less competition of Eastern Manufacturers for Western and Southern business, thereby leaving competition in these districts open for the concerns located therein.

The Standard Sanitary Manufacturing Company, of Louisville, which has installed a lot of machiery, and put up additional buildings in order to take care of some shell contracts, now faces a very short run of business in this department. However, much of the equipment can probably be used for other purposes.

J. W. Rademaker, manager of the Independent Brass Works, reported that so far peace hasn't had much effect on his business, and that he is working about full time on numerous small local orders, and a few sub orders, some of which are for Government equipment.

Hines & Ritchey as usual report a very brisk demand for special castings and work for machinery to preserve foods. The plant is being kept very busy.

The Vendome Copper & Brass Works, the house of Matt Corcoran and Company, and Ahlers & Gregoire, represent the three houses with the largest percentage of emergency fleet work on hand when peace was declared. These companies are still busy, and expect to complete a large percentage of the work covered by the orders.

As a whole Louisville coppersmiths are looking forward with an optimistic view. Conditions appear to be very uncertain, and unsettled, but the trade has weathered many storms, prohibition and otherwise, and feels that the outlook could be much worse—O. V. N. S.

PHILADELPHIA, PA.

DECEMBER 9, 1918.

With business passing through a period of re-adjustment from a war to a peace basis the metal trades of this city find in most instances that trading has become quiet. In some lines business is virtually lifeless. This latter condition is especially noticeable among buyers of old material, while smelters find little moving in the way of new business. There is still some war work being done but this in most cases is to complete contracts that were placed many weeks ago and of which contractors have been permitted to proceed on. The plating trades are not busy but they look forward to a period of activity within the near future. This is due to the removal of government restrictions on many classes of work. Those whose chief business is the plating of fixtures going into building work are discouraged by the opinions expressed by prominent builders that building will be in full sway by spring. Firms who do nickel plating work for stove concerns also predict an early opening of an active season. Dealers and sellers of metals in most cases find that there is little demand and the sudden termination of hostilities brought a quick withdrawal from the market of large users of the products which were so eagerly sought but a short time ago.

Despite the quiet tone which has been thrown over the metal trades there is an optimistic view taken by factors in the industry, who feel that when the period of readjustment is further progressed that a brisk demand will be noticeable to supply the needs of civilian work which have gone unfilled for several months.

Metal trades of this city that have had no war work or only a small amount are optimistic over the labor situation. While conditions show a slight betterment in some shops it is felt that within a short time that many workers who were lured away from their old places by high wage offerings in plants engaged on government work will soon seek their old places. With an anticipated good demand for virtually all metals and metal goods at an early date to fill the depleted civilian market, metal firms will be in need of a good labor supply which can be readily obtained.

Fire on November 26 damaged the metal foundry of Louis Blumberg, 333 North 3rd St., to the extent of $3,000.—F. W. C.

TRENTON, N. J.

The signing of the armistice with Germany and the coming of peace once again has had no effect as yet on the Trenton metal industries. About seventy-five per cent. of the Trenton plants are engaged on Government orders, and it is now a question whether these orders will be completed in full. Up to this time the manufacturers have not received any word to cease operations on federal work, but it is believed that word to this effect will come later. Some of the Trenton plants have Government work that will require more than a year to finish. Manufacturers are looking forward to a very prosperous season because of the great amount of building to be done this winter and the coming spring. Hardware dealers predict that their trade will have the greatest opportunity in history now that the war is over. It is also predicted that foreign nations will look to this country for a great amount of hardware. Now that the Government embargo on building operations has been lifted it will mean better business for the metal plants.

All the Trenton metal industries contributed liberally to the recent United War Work Fund and many of them went above the 100 per cent. mark with money. Ferdinand W. Roebling, Jr., and Karl G. Roebling, officials of the John A. Roebling's Sons Company, each contributed $1,000, while the company gave $5,000. The Jordan L. Mott and the Bowman Company, operated by O. O. Bowman, vice-president of the former company, gave $3,000. The Jonathan Bartley Crucible Company contributed $1,000.

Trenton metal manufacturers are elated over the fact that the Government has issued a new order to the effect that all concerns can now have their full supply of coal for the winter without any more "red tape." The first order was to the effect that manufacturers could not use anthracite coal in excess of buckwheat, and many of the concerns were having trouble in getting soft coal. John S. Broughton, Trenton and Mercer County Fuel Administrator, has informed the metal manufacturers that they can have all the coal they want for the coming winter, and that they can also store coal for next spring. This will allow the plants to run on full time during the winter months without interruption because of a scarcity of coal.

The Reliable Electric Plating Company, of West Orange, N. J., has been incorporated with $50,000 capital to operate as silversmiths. Joseph Danbeck, Helen Danbeck, and Adolph Danbeck, all of West Orange, are the incorporators.—C. A. L.

PROVIDENCE, R. I.

DECEMBER 9, 1918.

Every industry in Providence went practically out of business for the entire day on November 11, upon the announcement of the signing of the armistice. And places which did not close voluntarily were forced to close soon after the opening hour when the workers left their places and went out to celebrate. It was a day that will never be forgotten in this city. It was one whirl of wild enthusiasm from daylight until midnight and only then was there any cessation because of sheer exhaustion.

The Gorham Manufacturing Company's plants at Elmwood, Phillipsdale and Eddy street; the Brown & Sharpe Manufacturing Company, the Nicholson File Company, American Screw Company, the General Fire Extinguisher Company, Lord Construction Company, the Field's Point plant of the Bethlehem Shipbuilding Company, Ltd., the hundreds of manufacturing jewelry establishments, the numerous textile plants and all the other large establishments throughout the city and suburbs closed, and their thousands of workers paraded the streets of Providence.

Employees of the Brown & Sharpe Manufacturing Company, thousands in number, men and women, paraded about 8 o'clock in the morning, forming on Exchange Place so that the centre of the city was completely tied up so far as traffic was concerned for nearly an hour while the big line got under way. Then behind Foreman Kenyon marched 950 employees of the American Screw Company with hundreds of others in motor trucks and horse-drawn vehicles, wildly shouting and waving flags. Several hundred men and women from the General Fire Extinguisher Company marched behind a band later in the forenoon. All the men and women had white yachting caps, and one carried a picture of the Kaiser with cow bells hung around his neck.

The sudden ending of the war has brought complications and business problems to the manufacturers of this city and vicinity, as well as in other sections of the country. Cancellations are the disturbing factor. Where a few months ago the manufacturer was at his wits' end to find a way to meet the demands made upon his personal organization and machinery, now he is equally anxious to prevent the cancelling of orders for goods that were contracted for while the war was still on and for which he had provided the stocks of raw materials needed for the fulfillment of his contracts. The situation is a somewhat serious one in a number of Rhode Island establishments that have been engaged in work for the Government. With the notice of the first cancellations came a curtailment of hours and employees. All overtime was stopped and hundreds of employees were laid off. In addition to this other hundreds who had been attracted from their regular vocations to take positions on Government work on account of the alluringly large wages and extra pay for overtime, immediately began to scurry back for their old jobs so as to be safely housed when the actual rush came for positions in regular lines.

The large place which Providence has had in the material progress of the country for a century or more, her contributions to the war work of the last year and a half and the skill of her artisans and the enterprise of her manufacturers and merchants and corporation managers, are an assurance, if assurance were needed, that the State's chief city will retain and maintain her place among the industrial and mercantile communities of the country during the great reconstruction period that is now on.

While the war was on her metal workers, her jewelers and silversmiths were forced into the fashioning of strange devices. Her machinists were kept busy, but their products were devoted to new uses. Machines for the fashioning of engines of destruction took the place of those that had been designed as tools for the fabrication of labor savers in times of peace. The artisan who had been accustomed to making articles of personal and household adorning out of the precious metals turned his art and facile fingers in making war munitions. Everything was changed, everything at sixes and sevens, so to speak in the industrial world.

It was no new experience for Providence to be engaged in the manufacture of arms and ordnance. Some of her shops had supplied the warring nations in other smaller wars with the best weapons used, but the period which has happily ended in a victorious peace, was the first in which the entire industrial community was in whole or part diverted from its usual familiar occupations to devote itself to the industries that make modern war what it has proven to be in its latest terrible development.

There is no reason, however, to fear that in their adaptability to the conditions that have followed and are to follow the end of the war, the people of Providence will be found lagging behind other communities. The war experience has enabled Providence to find itself, as it were, and fit her for an advance in all the lines in which she has been prominent in the past and in new lines of endeavor in which her destiny as the metropolis of southern New England seems irrevocably fixed.

Notice has been filed at the office of the Secretary of State that the capital stock of George W. Dover, Inc., manufacturers of machine products, metal ornamentations and jewelers' findings, has been increased from $20,000 to $100,000.

The three-story addition, 65 by 75 feet, that is being made to the No. 5 building at the Brown & Sharpe Manufacturing Company's plant, is well under way and will soon be roofed. The building is of concrete construction with concrete floors.

The addition to the plant of the Rhode Island Tool Company, on West River street, Providence, is nearing completion and the roof is about ready to put on. It is of brick, one-story high, 92 by 40 feet, with saw-tooth roof.

The Adams Novelty Company, to be located in Providence, with a capital stock of $30,000 for the manufacture of jewelry and novelties, has been granted a charter under the laws of Rhode Island. The incorporators are Alfredia Adams, Thomas Adams and Benjamin W. Grim.

The Owren Casting Company of Attleboro has recently been incorporated and is planning for the occupancy of larger quarters. For a number of months this concern has been engaged on Government work, and has gradually outgrown the building on Union street occupied by the firm since its establishment. O. C. Wyversten, who has for some time been assistant superintendent of the Weir Foundry Company, Taunton, Mass., has become manager. The firm is now installing five new furnaces for the purpose of melting scrap brass, nickel silver and other scrap of the jewelry factories and intends to eventually include melting and rolling of larger scrap.

Louis G. Schwab has been granted a permit for the erection of a two-story brick workshop, 40 by 65 feet, at 511 Eddy street. The building is to be used for manufacturing purposes by the Providence Coppersmithing Company, of which Mr. Schwab is manager.

The extensive work which was started late last August at the Colvin foundry, 185 Globe street, Providence, is nearly completed. It consisted of building several coke and sand bunkers of reinforced concrete, two stories high; a one-story reinforced concrete building, 26 by 44 feet, containing five core ovens; a shipping room and shipping sheds and retaining walls for the storage of pigs of metal.

W. H. M.

MONTREAL, CANADA

DECEMBER 9, 1918.

The majority of the metal manufacturing concerns in Montreal are still running to their full capacity. Generally speaking, all goes well. The passing of the painful period of war with all its kindred suffering and the cheer of the oncoming holiday season tend greatly to stimulate optimism in the outlook. The reconstruction program is well advanced, preparations are being made for the resumption on a large scale of building operations and public works. The railway companies whose construction operations have wholly been suspended during the war, are planning and going ahead with extensions. The soldiers' Settlement Board, newly organized, is embarking upon its plan for agricultural instruction for those disposed to go on the land and there are other varied activities.

Munition business is practically at an end as far as the sale of machinery and equipment is concerned. There may be some business yet in connection with American orders, and Canadian firms are sharing in them. In fact, one firm shipped this past month, on an order it had secured for a

quarter of a million in equipment delivery to be made at an American shop. Canada's record in the output of munitions is one that can hardly be appreciated. This country has been the outstanding success in the turning out of all sorts of munitions and fuses. The making of airplanes record has been well sustained and the consumption of metals has been enormous. The disposal of the machinery that has worked in shell shops is going to be a big problem. This machinery divides into three parts: (1) the single purpose machines that are good for nothing but certain shell operations, these will be scrapped in the majority of cases; (2) standard machines that have been fitted with special attachments for the turning out of munitions, these fittings can be stripped and the machine can be brought back to its original capacity and style; (3) the general purpose lathe or machine that has been used well if it has withstood the working of continuous operation can be used in regular production and shop practice again.

Scrap metal dealers are practically out of the market, as they do not want to buy anything because they cannot see where they are to find a ready market for scrap material, and it would be suicide for them to buy for stock at the present high market and run chances of disposing of the material in a lower market.

The concerns working on copper and brass marine goods are running to their full capacity and the prospects for the Winter season are very encouraging.

The Jenkins Brothers Company, Ltd., St. Remi St., is making extensive improvements to its plant with the addition of new buildings and rest rooms for the employees. The plant is now running double forces to keep up with its orders.—P. W. B.

BUSINESS CONGRESS AT ATLANTIC CITY

DECEMBER 6, 1918.

A large gathering of representative business men attended the Reconstruction Congress of War Service Committees representing the principal industries of the country, held on December 3, 4, 5 and 6 at Atlantic City, N. J., under the auspices and management of the Chamber of Commerce of the United States of America.

The object in bringing together the War Service Committees of American industries was to provide an opportunity for free discussion of business problems and needs during the reconstruction period, to encourage co-operation in solving these problems and to formulate and present recommendations to the Government and National legislature for such action as the situation demands.

On the opening day, December 3, over 380 separate meetings were held by War Service Committees representing different lines of business. The results of their deliberations, boiled down and put into the form of resolutions, went through a sifting out process at the hands of a series of committees and finally reached the Clearance Committee of the Chamber of Commerce. Final action was taken at the concluding general session of the Congress, which passed resolutions urging among other things, amendments to the Sherman anti-trust law, the Clayton law and the Webb law.

At the meeting on December 4 of "related group No. 15," comprising the metal industries (not iron), a resolution was adopted recommending that the Government establish a single bureau to take charge of the disposal of the vast quantities of unused and waste metal materials that the Government has on hand, and that the utmost caution be exercised by the Government when placing these materials on sale, to do so gradually and in limited quantities to avoid demoralizing the market.

Other resolutions were passed recommending changes in the patent laws, the adoption of a uniform system of cost accounting and changes in existing laws governing the maintenance of resale prices by manufacturers.

AN AMERICAN METAL EXCHANGE.

At a meeting on December 5 of the metal committee known as "major group No. 4," L. M. Brile, of the United Smelting & Aluminum Company, made a strong plea for the establishment of an American Metal Exchange, which should be a free market in spot and futures, and which should fix metal prices on the basis of actual transactions, and not permit them to be based as at present, on prices cabled from abroad.

Before the war, declared Mr. Brile, prices in the United States virtually were made in Germany, whose control of the English market enabled her to influence the London cables on which New York prices were based and thus control New York transactions, with the result that when Germany wished to buy copper, for instance, the London copper cables "went down," but when American consumers were in the market for metal, the cables "went up."

It was ridiculous, asserted Mr. Brile, for the United States, the world's largest producer of basic raw materials such as copper and zinc, to permit the prices of these metals to be fixed and manipulated at the pleasure and for the profit of foreign consumers and he moved that a resolution be adopted recommending the establishment of a bona fide metal exchange as the best remedy for the intolerable situation. This resolution, however, was not adopted, it being the consensus of opinion that while the matter appeared to be one of vital importance, it did not come within the scope of the present conference, but should be taken care of by the metal trades themselves without referring it to the Government for action.

CO-OPERATION VS. CUT-THROAT COMPETITION.

A noticeable feature of the meetings of the Reconstruction Congress was the emphasis laid by a number of speakers on the duty of developing foreign business in a spirit of co-operation with our Allies, some of whom have almost ruined themselves financially fighting for world freedom while America has been piling up uncountable profits. As pointed out by several speakers, it would be both base ingratitude and bad business for America to take advantage of the favorable economic position the war has put her in by adopting a "grab-it-all" policy and endeavoring by cut-throat competition to oust any of the other nations who have been associated with us in winning the war from their old foreign markets.

Secretary Redfield, of the Department of Commerce and Labor, speaking on this subject, in the course of an address, for himself and not officially, said:

"We resented the German attempt at economic conquest backed up by military force, but it would be quite as evil if we allowed the power of economic force, ruthlessly exerted throughout the world, to grasp for our sole profit the commerce of the world. Commerce is an evolution, a growth, and it is not commerce in any just sense unless it benefits all concerned.

"We must serve the world if we are to be on safe foundations ourselves. The mere entering a foreign market by force of cut prices or of off-quality goods or by dumping or by untruthful advertising, or by force of Government aid or political power is in no true sense commerce, nor will it last. We must not learn the evil lessons from those whose power we have destroyed. We must carry the flag as high in the commercial world as we have carried it before our armies."

Paul Warburg, of Kuhn, Loeb & Company, said:

"In the war we have made common cause with the Allies. We should likewise make common cause with them in seeking the solution of the immediate problems of reconstruction which they face because of the efforts they put forth in the war. These problems peculiarly depend for their solution upon commerce. Raw materials and industrial equipment which we possess the Allies urgently require, that they may reconstitute their economic life. We should deal generously with them in sharing these resources. * * * Without doubt we shall consider it our proud privilege to give whatever we can spare to those that deserve our aid, particularly to those who, like France and Belgium, have an undoubtedly valid moral claim on us, and to that end we shall have to continue to reduce our own consumption to the necessary degree."

VERIFIED NEWS OF THE METAL INDUSTRY GATHERED FROM SCATTERED SOURCES

The W. H. Prier Company, Marshalltown, Iowa, recently organized and incorporated, is building a brass foundry addition, 60 x 150 feet.

The Spencer Metal Products Company, Spencer, Ohio, has increased its capital stock from $50,000 to $100,000. The company operates a tool and grinding room.

The Detroit Copper and Brass Rolling Mills, Detroit, Mich., has awarded the contract for the erection of an addition to its plant at an estimated cost of $400,000.

The West Bend Aluminum Company, West Bend, Wis., has completed a new factory and warehouse, and has trebled its capacity of aluminum ware. The improvements cost approximately $100,000, including equipment.

Burdick & Son, Hamilton and Mosher streets, Albany, N. Y., announces that the three-story building which was erected to replace the one recently destroyed by fire has been completed, new machinery installed and the factory in complete operation.

The Eagle Brass Foundry, Seattle, Wash., is constructing a one-story addition, 76 by 90 feet, at 21 Spokane street, and is contemplating a two-story building, 55 by 70 feet, for a machine shop. The company now operates a brass, bronze and aluminum foundry, and brass machine shop.

The N. & G. Taylor Company, 300 Chestnut street, Philadelphia, Pa., manufacturer of tin plate and metal specialties, is offering for sale its property at Tasker street and Delaware avenue, consisting of a building 148 by 380 feet, with a total floor area of 46,000 square feet.

The Metal Disintegrating Company, 3 South William street, New York, is having plans prepared for the erection of four two-story, 200 x 400 feet factory buildings to replace those recently destroyed by fire. The company is not sure at this time where the buildings will be located.

The J. Birtwistle Brass Foundry, Jersey City, N. J., has filed notice of organization to operate a plant at 877 Communipaw avenue. J. H. Birtwistle, 160 Boyd avenue, and Hector W. H. McIntyre, 355 Union street, head the company. The company will operate a brass, bronze and aluminum foundry and casting shop.

The Walker M. Levett Company, 415-421 East 23rd street, New York, now has in operation a fully equipped chemical and physical laboratory under the supervision of V. E. Ottobre. This company makes a specialty of manufacturing die cast aluminum and magnalite pistons for aeroplane motors, automobiles, trucks, tractors, tanks and motor boats.

James Savage retired from the brass foundry business Oct. 10, 1918. The business, at 203 Diamond street, Brooklyn, N. Y., has been purchased by Messrs. Albee, Godfrey and Bullock, of Brooklyn, N. Y. The new company is engaged in making ship supplies for the Fleet Emergency Corporation. The company has leased the property for a number of years.

The Grand Rapids Brass Company, Grand Rapids, Mich., has increased its capital stock from $300,000 to $500,000. The company plans to build a three-story addition to its factory and at the present time operates a brass, bronze and aluminum foundry, brass machine shop, grinding room, stamping, tinning, brazing, soldering, plating, polishing and lacquering departments.

Robert R. Moton, Principal of Tuskegee Institute, of Tuskegee, Ala., has issued the following appeal:

Tuskegee Institute has suffered a very serious loss in the destruction by fire of the Trades Building. With the prevailing prices of building material, it will cost not less than $250,000 to replace the building and equip it. The insurance did not represent half of that amount. They are, therefore, appealing to the generous friends, who have stood so loyally behind Dr. Washington, the founder, as well as the present principal, to help in the present emergency, so that they may go forward with this very important phase of their work.

REMOVAL

The general offices of **E. C. Humphrey Company**, Chicago, Ill., are now located at 1242-4 Conway Building, 111 West Washington street, to which office all correspondence should be addressed. The company still maintains branch offices with warehouse stocks of alloys, refractory and foundry material at Detroit, Mich., Cleveland, Ohio, Pittsburgh, Pa., and Birmingham, Ala.

U. S. COPPER PRODUCTS COMPANY

Since the notice of incorporation of the **U. S. Copper Products Corporation,** Cleveland, Ohio, published in the August issue of THE METAL INDUSTRY, the company now reports further progress. A tract of land approximately 685,000 square feet has been purchased in Cleveland and plans are now under way for the buildings which are to comprise the plant. These buildings, as at present planned, will necessitate an expenditure of $600,000. The capacity of the plant when it first starts is stated to be 2,500,000 pounds per month, operating one shift per day of ten hours. The product of this new plant will be, as has already been mentioned, brass and copper seamless tubes, wire, sheet and rod. The executive officers of the new company and who also comprise the Board of Directors are E. I. Heinsohn, president and general manager; E. S. Griffiths, vice-president; Edward A. Noll, vice-president; John H. Price, secretary and R. H. York, treasurer. William Herbert Keene is chemist and metallurgist.

BUSINESS TROUBLES

The business troubles of the **Connecticut Brass & Manufacturing Company,** Waterbury, Conn., are apparently nearly over. According to a recent report made by the Receiver, W. H. Coverdale, the following information is given:

Of the 9,000,000 pounds of unprofitable orders on the corporation's books at the date of receivership (September 5, 1918) 6,000,000 pounds are already cancelled, and the balance will also be cancelled unless such price adjustments can be secured as will prevent further loss. Following such cancellations new business carrying advanced prices and definite delivery dates can be secured. Certain of the receiver's cancellations may form a basis for damage suits.

The receiver at this writing has outstanding orders of 3,000,000 pounds, of which 2,250,000 pounds represent new business at an average advance in price of 10 cents per pound, and the balance of 750,000 pounds represents orders still in process of adjustment, which may result in further cancellations.

AMERICAN RED CROSS

In connection with the Christmas Roll Call of the American Red Cross which opens December 16 for the purpose of Universal Membership, the Publicity Division has recently issued three interesting stories in pamphlet form. These stories are "Overseas with Our Boys" showing how the portable kitchens, rolling canteens and mobile hospitals bring comforts to trench and field; "Carry On," which is devoted to the physical reconstruction of the soldier in order to make useful workers of crippled men and "Fighting the Fight Over Here," which has been especially prepared for the Red Cross by Jane A. Delano, director, Department of Nursing. All three of these stories are interestingly illustrated and copies may be had by addressing the headquarters of the American Red Cross at 44 East 23rd street, New York.

1919 WAR SAVINGS STAMPS

The following statement made by William G. McAdoo, Secretary of the Treasury, has just been issued in Washington, D. C.:

"The Secretary of the Treasury has determined upon the issuance of a new series of War Savings Certificates and Stamps to be placed on sale early in 1919 and to be known as the Series of 1919. The new series will have a maturity date of January 1, 1924, and in practically all respects will be issued on the same terms and in the same manner as the present series of 1918.

"A new $5.00 War Savings Stamp, blue in color, bearing the head of Benjamin Franklin, the apostle of saving, and a former Postmaster General is in preparation. The new stamps will be placed on sale early in 1919.

"The same Thrift Stamps and Thrift Cards now in use will be continued in 1919 and will be exchangeable into new series of 1919 War Savings Stamps payable January 1, 1924, in the same way as the exchange has been made during this year into the series of 1918 War Savings Stamps."

PRINTED MATTER

Fire Brick.—The Quigley Furnace Specialties Company, New York has issued a small folder giving information concerning their new refractory brick which is called Insulbrix. This is an especially prepared cellular insulating brick which is to be used for keeping heat in or out of furnaces or other structures.

Lacquers.—The Hilo Varnish Corporation, Brooklyn, N. Y., has issued Bulletin No. 2 containing facsimile samples of the standard shades in Hilo colored lacquers. This corporation manufactures varnishes, enamels and japans, together with air drying and baking colored lacquers. Samples of the color card may be had upon request.

Foundry Sprayer.—The J. W. Paxson Company, Philadelphia, Pa., has issued a small booklet containing description and illustrations of the Type D-A. Aeron sprayer for foundries. This sprayer is used for the spraying of blacking on molds and produces a rapid method for the application of the coating and insures a complete and positive covering of the mold.

Electric Furnaces.—The General Electric Company, Schenectady, N. Y., has issued a very interesting loose-leaf folder catalogue Y-1136 on electric heat treating furnaces. In this catalogue there is included a great deal of information relating to heat-treating furnaces operated by electricity and in addition to the text matter is given a number of illustrations corresponding to the description in the text.

Babbitt Metals.—The Committee on Babbitt Metals of the War Service Association of the Manufacturers of Solder and Bearing Metals, 30 Church street, New York, has submitted a very interesting report to the War Industries Board on the conservation of tin. The report comprises twenty pages and gives a number of very valuable recommendations as to how the supply of tin in the United States may be conserved in the matter of babbitts and tin base bearing metals. This committee was composed as follows: C. H. Clamar, chairman; Christopher H. Bierbaum, E. T. Merrick, Lazarus Muscat, W. A. Cowan and L. D. Waixel.

CATALOG EXHIBIT

An exhibition of every kind of catalog may be seen at The Metal Industry office, 99 John street, New York. The Metal Industry is prepared to do all the work necessary for the making of catalogs, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

METAL STOCKS MARKET QUOTATIONS

New York, December 9, 1918.

	Par.	Bid.	Asked.
Aluminum Company of America	$100	$500	$600
American Brass	100	205	210
American Hardware Corp.	100	138	140
Bristol Brass	25	38	39
Canadian Car & Foundry, com.	100	28	32
Canadian Car & Foundry, pfd.	100	81	85
Eagle Lock	25	75	80
International Silver, com.	100	25	50
International Silver, pfd.	100	80	90
New Jersey Zinc.	100	262	268
Rome Brass & Copper	100	300	350
Scovill Manufacturing	100	340	365
Standard Screw, com.	100	270	275
Standard Screw, "A" pfd.	100	103	—
Yale & Towne Mfg. Co.	100	200	210

Corrected by J. K. Rice, Jr., & Co., 36 Wall street, New York.

METAL MARKET REVIEW

Written for The Metal Industry by W. T. Partridge.

December 9, 1918.

COPPER.

Of paramount importance in the copper industry was the signing of the armistice November 11. Immediately the question of the continuance of the agreed upon price—26c per pound for prime lake, electrolytic and casting copper—arose. This and the general expectation that cancellations in existing Government contracts would quickly follow the cessation of hostilities developed uncertainty and suspense that brought the market to a standstill awaiting events.

A conference at Washington November 15, between representatives of the copper producers and the War Industries Board, at which measures for the best interests of all concerned during the reconstruction period were discussed, resulted in an announcement that there would be no revision of price and no change in regulations governing the industry before January 1, 1919. Another meeting will be held in late December, when developments in the interim will be considered in relation to future Government control—if any—of the market.

Interest in the trade was largely centered in the export situation, the principal feature being the movement now under way for the formation of an American combination of producing and selling interests—permissible under the Webb law—to meet the steps that have been taken abroad to organize buying syndicates representing foreign consumers, for the purchase of copper in large quantities in the American market.

Few cancellations of Government contracts which have been calling for 85 to 90 per cent. of the entire copper supply of the country have been announced as yet. Other consumers, under existing conditions, were not placing orders except for casting copper, the grade often made from scrap, and which in pre-war times was generally sold at less than prime lake or electrolytic metal. This grade throughout the month was in small but increasing demand at prices below the agreed upon basis of 26c per pound; sales at the beginning of the month were made at 25c, and this continued to be shaded until the quotation at the close was 23.75c in the open market.

No doubt exists in the trade, either by producers or consumers, that peace time requirements will be as great as during the war period and that the readjustment will be accomplished without serious disturbance in the trade.

Exports in October were the smallest in ten years, being only 9,680 tons. Arrivals at port of New York were 7,630 tons ores, 2,010 tons matte and 12,895 tons copper.

TIN.

With the war over before full details of the administration of the Inter-Allied-Executive were known to the trade—particularly in regard to the fixed price—and the necessity for such world control passed, the tin situation in November was even more complicated than before. The Importers' Association, Inc., presented resolutions and an alternative plan to the War Industries Board, by the adoption of which, they claimed, the United States Steel Products Co. could be relieved of responsibility for all importations and the importers be allowed to resume business. Uncertainty brought the market to a standstill temporarily, but with the pressure in demand for Government work over, consumers in many instances found themselves burdened with larger stocks of tin than requirements called for. Transactions were few and prices during the month receded from 76c per pound at the beginning to 69.50c at the close for Straits metal.

The fixed price, it was understood, had been determined upon, and announcement was made on Dec. 4 by John Hughes, chairman of the Pig Tin Committee, of 72½c.

Arrivals at Atlantic ports in November were small, only 125 tons being received. At Pacific ports, 2,244 tons were reported. Bolivian reductions to fine tin were only 3 tons during the month, making a total of 8,766 tons for first ten months, as compared with 4,849 tons during all of 1917.

LEAD.

The lead market in November remained under strict control of the Producers' Committee at its fixed prices, 7.75c E. St. Louis, 8.05c New York for wholesale lots. Jobbers' prices in New York declined from 8.50c prompt ex store to 8.37½c and less than one ton lots from 8.80c. to 8.50c per pound. The shortage of lead continues with no prospect of increased production at an early date. Lead ore was strong at $100 per ton throughout the month. Exporters of lead, with stocks made from imported material were offering metal at 7.00c in bond toward the close of the month, but no buyers were reported. However, with the lifting of the ban on exportation, that has been in force for some time, these offerings will disappear. London prices advanced sensationally on November 29 to £40 10s after being pegged for more than a year at £29 10s.

Exports during first nine months were 24,091 tons from foreign material in bond and 49,927 tons from domestic material. Importations during the same period were 69,575 tons.

SPELTER.

The feature in November was the return of galvanizing interests to the market as buyers after the signing of the armistic. This gave support which not only arrested the decline in prices which had proceeded from 8.65c E. St. Louis, 9.00c New York to 8.15c E. St Louis, 8.50c New York by the 18th, but it caused a gradual advance thereafter to 8.40c E. St. Louis, 8.75c New York for prompt prime Western shipments. First quarter 1919 position was held at 8.00c E. St. Louis, 8.35c. New York. High grade ore remained firm at $75 per ton, but second grades declined to $40-45 per ton. In the London market spelter advanced to £56 on the 29th, the first change in more than a year, indicating a market for American spelter abroad as soon as the export ban is lifted and ships become available.

Exports during first nine months from domestic ores were 49,628 tons, and from foreign ores 13,815 tons. Imports for same period amounted to 18,048 tons pigs and contents of ore.

ANTIMONY.

The demand for antimony which for some time has been light, was further affected by the ending of the war. Prices declined rapidly from 12.75c at the close of October to 8.50 to 8.75c duty paid New York for wholesale, and to 8.75 to 9.00c for spot jobbing lots. These prices are below the cost of importation from the Orient. Importations in August were 1,297 tons, making the total for first eight months 7,616 tons, according to Metal Exchange figures.

ALUMINUM.

The Government has released aluminum supplies for domestic consumption, but thus far has made no change in the maximum base price—33c per pound for ingots 98-99 per cent. pure in 50-ton lots f. o. b. U. S. producing plants—established last June, to be effective until March, 1919. An active demand for export was reported late in the month at 38 to 40c per pound, so there is small prospect of sales for home consumption at the Government price. Estimated production in the United States for the current year is 250,000,000 pounds, indicating an increase of 30 per cent. over production of 200,000,000 pounds in 1917. World production for 1918 is estimated at 375,000,000 pounds.

SILVER.

The price of silver, $1.01⅛, throughout November was unaffected by the ending of the war. Exports in October were $32,000,000, indicating an increase of $22,000,000 over the September outgo, which was small. The total for first ten months was $197,000,000. Imports in October were $7,000,000, making the total for first ten months $62,000,000

PLATINUM.

The ban on platinum was lifted by the War Industries Board on November 19, when the superintendent of the U. S. Assay Office, New York, announced the discontiuance of the receipt of further supplies for account of the Ordnance Dept., with the exception of metal specifically commandeered. The price remained unchanged at $105 per ounce for pure.

QUICKSILVER.

Existing Government contracts for quicksilver will be paid for at the agreed upon price, $125 per flask of 75 pounds. While the demand for medicinal purposes will be lessened after January 1, 1919, Government requirements for anti-fouling paint for use on ship bottoms will continue to absorb a large quantity of metal. Outside of Government contracts the price was $123 per flask in November.

OLD METALS.

A collapse in demand and in prices of old metals followed the signing of the armistice in November. The heaviest declines were 13c per pound to 42c on No. 1 pewter, 10c on block tin pipe to 55c. Old cast aluminum fell 5c to 21c; old sheet mixed and new aluminum 3c each to 23 and 26c respectively. The coppers and compositions averaged a 2c to 3c drop on each item, also the brasses. Zinc and lead suffered less, the decline ranging from ¼c per pound on new zinc to 7c per pound and 1¼c to 6.50c for electrotype. Tea lead declined 1c to 5c per pound.

WATERBURY AVERAGE

Lake Copper. Average for 1917—30.97. 1918—January, 23.50. February, 23.50. March, 23.50. April, 23.50. May, 23.50. June, 23.50. July, 26.00. August, 26.00. September, 26.00. October, 26.00. November, 26.00.

Brass Mill Spelter. Average for 1917—11.116. 1918—January, 9.60. February, 9.60. March, 9.40. April, 8.50. May, 8.95. June, 9.50. July, 10.30. August, 10.45. September, 11.20. October, 10.60. November, 10.20.

NOVEMBER MOVEMENTS IN METALS

	Highest.	Lowest.	Average.
Copper:			
Lake	*26.00	*26.00	*26.00
Electrolytic	*26.00	*26.00	*26.00
Casting	*26.00	*26.00	*26.00
Tin	Market nominal; no metal offering.		
Lead	8.05	8.05	8.05
Spelter (brass special)	8.87½	8.30	8.539
Antimony	11.75	7.75	9.098
Aluminum	†33.10	†33.10	†33.10
Quicksilver (per flask)	$125.00	$125.00	$125.00
Silver (cts. per oz.)	101⅛	101⅛	101⅛

*Government maximum price. †Government maximum price for carload lots.

Metal Prices, December 9, 1918

NEW METALS

COPPER—DUTY FREE. PLATE, BAR, INGOT AND OLD COPPER. Manufactured 5 per centum.		
Electrolytic, carload lots, nom. } Lake, carload lots, nominal... }	Government price.	26
Casting, carload lots, nominal		26
TIN—Duty Free.		
Straits of Malacca, carload lots		none offered
LEAD—Duty Pig, Bars and Old, 25%; pipe and sheets, 20%. Pig lead, carload lots		7.05
SPELTER—Duty 15%.		
Brass Special		8.87
Prime Western, carload lots		8.75
ALUMINUM—Duty Crude, 2c. per lb. Plates, sheets, bars and rods, 3½c. per lb.		
Small lots, f. o. b. factory		....
100-lb., f. o. b. factory		....
Ton lots, f. o. b. factory	Government price.	33.20
ANTIMONY—Duty 10%.		
Cookson's, Hallet's or American		Nominal
Chinese, Japanese, Wah Chang WCC, brand spot		8.62
NICKEL—Duty Ingot, 10%. Sheet, strip and wire, 20% ad valorem.		
3 Ingots		40c.
Shot		43c.
ELECTROLYTIC		45c.
MANGANESE METAL		Nominal
MAGNESIUM METAL—Duty 20% ad valorem (100 lb. lots)		$1.90
BISMUTH—Duty free		3.50
CADIUM—Duty free	nominal	1.50
CHROMIUM METAL—Duty free	nominal	
COBALT—97% pure		3.00
QUICKSILVER—Duty 10% per flask of 75 pounds		$125.00
PLATINUM—Duty free, per ounce		105.00
SILVER—Government assay—Duty free, per ounce		1.01⅛
GOLD—Duty free, per ounce		20.67

INGOT METALS

Silicon, Copper, 20%	according to quantity	49	to54
Phosphor Copper, guaranteed 15%	" "	52	to59
Phosphor Copper, guaranteed 10%	" "	48	to54
Manganese Copper, 30%, 2% Iron	" "	65	to67
Phosphor Tin, guaranteed, 5%	" "	87	to92
Phosphor Tin, no guarantee	" "	86	to91
Brass Ingot, Yellow	" "	18½	to19⅛
Brass Ingot, Red	" "	26	to26⅛
Bronze Ingot	" "	25	to26
Parsons Manganese Bronze Ingots	" "	30½	to32
Manganese Bronze Castings	" "	38	to50
Manganese Bronze Ingots	" "	23	to30
Manganese Bronze Forgings	" "	44	to53
Phosphor Bronze	" "	24	to30
Casting Aluminum Alloys	" "	33	to38

OLD METALS

Buying Prices.	Selling Prices.
24.00 Heavy Cut Copper	25.50
23.00 Copper Wire	25.00
21.00 Light Copper	23.00
23.00 Heavy Mach. Comp	25.50
14.50 Heavy Brass	16.50
11.00 Light Brass	13.50
14.25 No. 1 Yellow Brass Turning	14.25
21.50 to 22.50 No. 1 Comp. Turnings	23.00 to 25.00
7.00 Heavy Lead	7.25
5.25 Zinc Scrap	5.70
10.00 to 13.00 Scrap Aluminum Turnings	11.00 to 14.00
19.00 to 21.50 Scrap Aluminum, cast alloyed	21.00 to 23.00
26.00 to 28.00 Scrap Aluminum, sheet (new)	28.00 to 30.00
55.00 No. 1 Pewter	60.00
22.00 to 23.00 Old Nickel anodes	25.00 to 26.00
30.00 to 32.00 Old Nickel	34.00 to 36.00

COPPER SHEET

Mill shipments (hot rolled) ..... 36c base net
From stock ..... 40c base net

ZINC SHEET

Duty, sheet, 15%. Cents per lb.

Carload lots, standard sizes and gauges, at mill, 15c. basis, less 8%
Casks, jobbers' prices ..... 17c.
Open casks, jobbers' prices ..... 17½c.

The above mill prices have been fixed by the United States Government, applying to civilian population of the United States and allied governments.

ALUMINUM SHEET AND ROD

Sheet Aluminum, outside market contract base price, 42.40c. per pound.

ROD.

B. & S. Gauge.
¾" to 1" Advancing by 32nds }
1" to 5/8" " " 16ths } 98% rolled, 43.10 cents per lb.
2⅝" to 3½" " " 8ths }
⅜" to ¾", 98% rolled and drawn ..... 48.80 cents per lb.

BLOCK TIN SHEET AND BRITANNIA METAL

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker. 100 lbs. or more, 10c. over Pig Tin. 50 to 100 lbs., 15c. over 25 to 50 lbs., 17c. over, less than 25 lbs., 25c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 500 lbs. or over at N. Y. tin price, 100 lbs. or more, 5c. over Pig Tin. 50 to 100 lbs., 12c. over, 25 to 50 lbs., 15c. over, less than 25 lbs., 25c. over.

Above prices f. o. b. mill.

Prices on wider or thinner metal on request.

LEAD FOIL

Base price—5.75 cents per lb.

TIN FOIL

Base price—No quotation.

PLATERS METALS

Nickel silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturer.

SILVER SHEET

Rolled silver anodes .999 fine are quoted at from $1.03 to $1.05 per Troy ounce, depending upon quantity.

NICKEL ANODES

85 to 87%	purity	.55c. per lb.
90 to 92%	"	.57½c. " "
95 to 97%	"	.60c. " "

Supply Prices, December 9, 1918

CHEMICALS

Acid—		
Boric (Boracic) Crystals	lb.	.25
Hydrochloric (Muriatic) Com., 18 deg.	lb.	.08
Hydrochloric, C. P., 22 deg.	lb.	.16
Hydrofluoric, 30%	lb.	.40
Nitric, 36 deg.	lb.	—
Nitric, 42 deg.	lb.	—
Sulphuric, 66 deg.	lb.	.08
Alcohol—		
Denatured	gal.	1.00
Alum—		
Lump	lb.	—
Powdered	lb.	—
Aluminum sulphate, iron free	lb.	.15
Aluminum chloride solution	lb.	.16
Ammonium—		
Sulphate, tech.	lb.	.10
Sulphocyanide	lb.	—
Arsenic, white	lb.	.25
Argols, white, see Cream of Tartar	lb.	.80
Asphaltum	lb.	.35
Benzol, pure	gal.	1.00
Blue Vitriol, see Copper Sulphate.		
Borax Crystals (Sodium Biborate)	lb.	.15
Calcium Carbonate (Precipitated Chalk)	lb.	.15
Carbon Bisulphide	lb.	.20
Chrome Green	lb.	—
Cobalt Chloride	lb.	—
Copper—		
Acetate (Verdigris)	lb.	.60
Carbonate	lb.	.45
Cyanide	lb.	.65
Sulphate	lb.	.15
Copperas (Iron Sulphate)	lb.	.08
Corrosive Sublimate, see Mercury Bichloride.		
Cream of Tartar, Crystals (Potassium bitartrate)	lb.	.80
Crocus	lb.	.15
Dextrin	lb.	.25
Emery Flour	lb.	.10
Flint, powdered	ton	—
Fluor-spar (Calcic fluoride)	ton	—
Fusel Oil	gal.	—
Gold Chloride	oz.	—
Gum—		
Sandarac	lb.	—
Shellac	lb.	—
Iron Sulphate, see Copperas	lb.	.08
Lead Acetate (Sugar of Lead)	lb.	—
Yellow Oxide (Litharge)	lb.	.20
Mercury Bichloride (Corrosive Sublimate)	lb.	—
Nickel—		
Carbonate Dr	lb.	.8[illegible]
Chloride	lb.	.70
Salts, single bbl.	lb.	.16
Salts, double bbl.	lb.	.14
Paraffin	lb.	.25
Phosphorus—Duty free, according to quality		60-80c.
Potash, Caustic (Potassium Hydrate)	lb.	—
[illegible]	lb.	—
Potassium Bichromate	lb.	—
Carbonate, 96-98%	lb.	.50
Cyanide, 98-99½%	lb.	—
Pumice, ground	lb.	—
Quartz, powdered	ton	—
Official	oz.	.73⅝
Rosin	lb.	.10
Rouge, nickel	lb.	.45
Silver and gold	lb.	.60
Sal Ammoniac (Ammonium Chloride)	lb.	.30
Sal Soda	lb.	.03
Silver Chloride, dry	oz.	—
Cyanide	oz.	—
Nitrate, 100 ounce lots	oz.	.6837
Soda Ash, 58%	lb.	.08
Sodium—		
Biborate, see Borax	lb.	.15
Bisulphite	lb.	.15
Cyanide	lb.	.30
Hydrate (Caustic Soda)	lb.	.15
Hyposulphite	lb.	.08
Nitrate, tech.	lb.	.12
Phosphate	lb.	.14
Silicate (Water Glass)	lb.	.08
Sulpho Cyanide	lb.	1.00
Soot, Calcined	lb.	—
Sugar of Lead, see Lead Acetate	lb.	—
Sulphur (Brimstone)	lb.	.10
Tin, Chloride	lb.	.75
Tripoli Composition	lb.	.06
Verdigris, see Copper Acetate	lb.	.60
Water Glass, see Sodium Silicate	lb.	.08
Wax—		
Bees, white ref. bleached	lb.	—
Yellow	lb.	.60
Whiting	lb.	.05
Zinc, Carbonate	lb.	.30
Chloride	lb.	.20
Cyanide	lb.	.50
Sulphate	lb.	.07

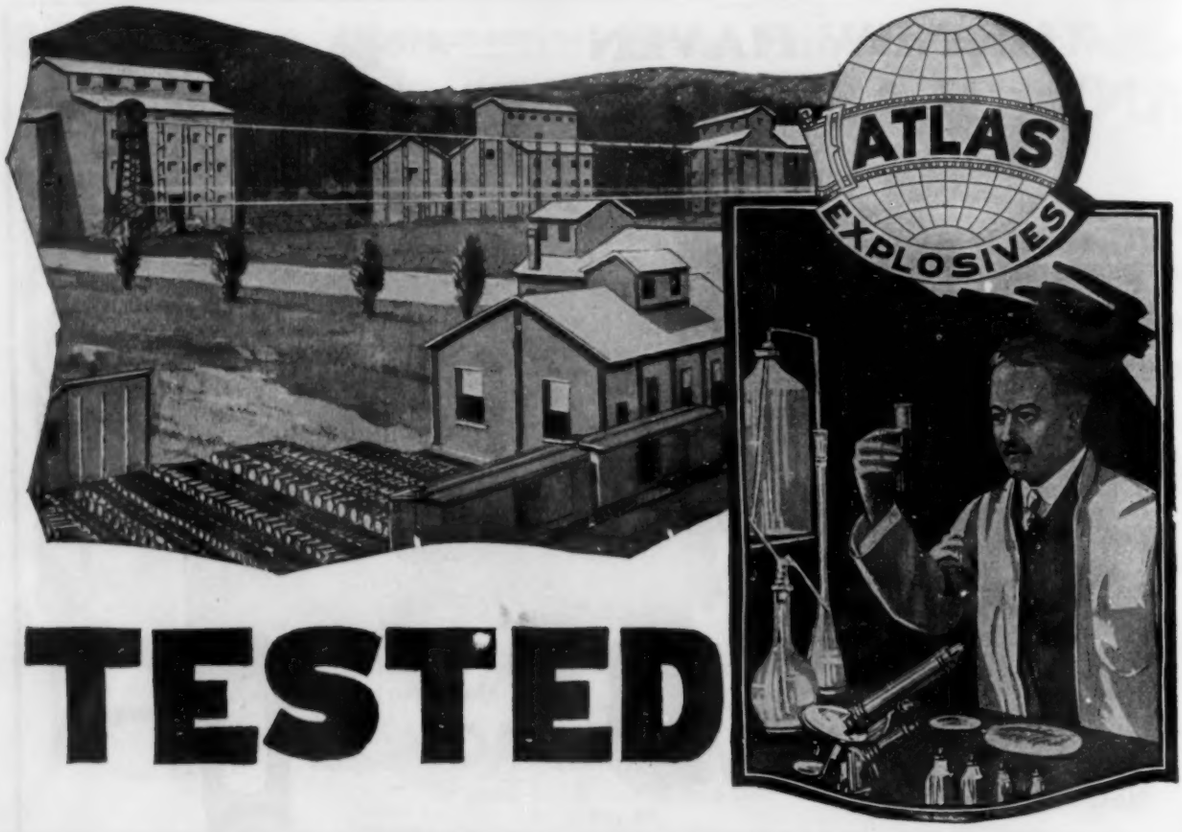
COTTON BUFFS

Open buffs, per 100 sections (nominal).		
12 inch, 20 ply, 64/68, cloth	base,	$77.50
14 " 20 " 64/68 "	"	102.50
12 " 20 " 84/92 "	"	93.00
14 " 20 " 84/92 "	"	120.60
Sewed buffs per pound.		
Bleached and unbleached	"	.65
Colored	"	.55

FELT WHEELS

White Spanish— Diameter	Thickness	Price	
6 to 20 inches, inc.	½ inch or under	$4.05	per lb.
6 to 20 inches, inc.	⅝ inch to ⅞ inch, inc.	3.45	"
6 to 9⅞ inches, inc.	1 inch to 3 inches, inc.	3.25	"
10 to 16 inches, inc.	1 inch to 3 inches, inc.	3.15	"
18 to 20 inches, inc.	1 inch to 3 inches, inc.	3.25	"
6 to 20 inches, inc.	over 3 inches	3.25	"

Grey Mexican— Diameter	Thickness	Price	
6 to 20 inches, inc.	½ inch or under	$3.95	per lb.
6 to 20 inches, inc.	⅝ inch to ⅞ inch, inc.	3.35	"
6 to 9⅞ inches, inc.	1 inch to 3 inches, inc.	3.15	"
10 to 16 inches, inc.	1 inch to 3 inches, inc.	3.05	"
18 to 20 inches, inc.	1 inch to 3 inches, inc.	3.15	"
6 to 20 inches, inc.	over 3 inches	3.15	"



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NOTES ON POLISHING GLUE

No. 12

The correct use of glue in the polishing room is most important, not only from the standpoint of economy, but also from the good or bad results obtained and the elimination of unjust complaints on the abrasive grain used. Too much care cannot be exercised on becoming familiar with each incoming shipment of glue.

Some may think that to prepare a solution of glue, all that is required is to throw a small amount of ground glue in with any portion of water, heat up to boiling and the glue is ready for use. Glue prepared in this manner would cause complaints against the glue dealer on the very first day of its use.

If glue is received in the sheet form, it is always well to pulverize it. Ground glue absorbs water and melts in heating so much sooner that the time spent pulverizing it is well paid for.

The amount of water to be added to any portion of glue should be determined in the cold water soak. This is very important, because the water absorption is a vital factor in obtaining the best holding power with the least amount of glue.

The glue pot should be thoroughly cleaned out in the evening, scoured if possible, so that no dried or overheated glue remains in it to contaminate the fresh solution. The best pots are made of copper, brass, or aluminum.

The greatest care in glue preparation should be during the heating operation. Never allow direct heat to come in contact with the glue pot, either as a coal fire or live steam. It is well to have the glue pot surrounded by a water jacket, heating the water either with live steam or by an electric coil.

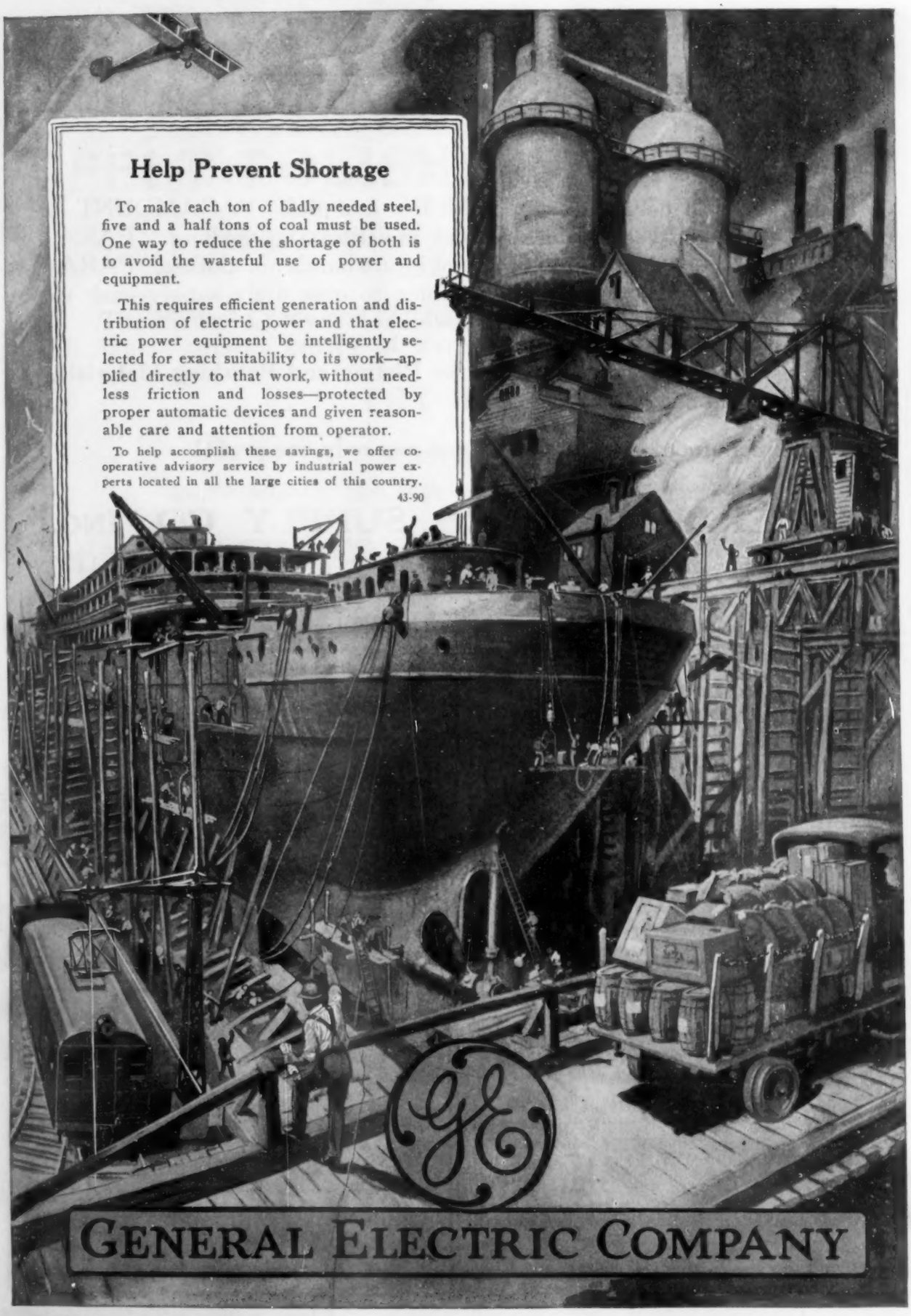
Under no circumstances should the temperature exceed 160 degrees Fahrenheit. The heating should be conducted so that the glue solution averages from 150 to 160 degrees Fahrenheit for from 1½ to 2 hours, after which it can be cooled down to between 130 and 140 degrees and allowed to remain in this condition while being used.

No more glue should be made up than can be used in one day. A glue that has been allowed to stand for 10 hours, then cooled overnight and reheated in the morning, is of absolutely no value.

Another factor which enters into the preparation of glue in open glue pots is the evaporation of water. If a great deal of the water has evaporated so that the glue solution has become thicker, after several hours of heating, it is a very simple matter and a custom in some polishing rooms to add water. This is detrimental to the entire solution, and it is also very unsatisfactory to use the thickened solution. Therefore all glue pots should be covered.

When setting up a polishing wheel it is important that the abrasive be heated before the glued wheel is rolled in it because if the abrasive is cold it has a chilling effect on the glue, reducing the sticking qualities.

After the wheels have received the applications of glue and abrasive, they should be dried for at least ten hours before using.



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TIME About 5 minutes when using a still tank and 30 to 40 minutes when using a plating barrel.

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Ball Bearing Lathe

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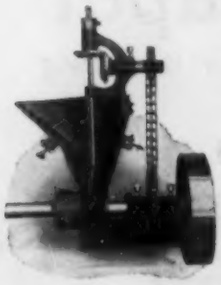

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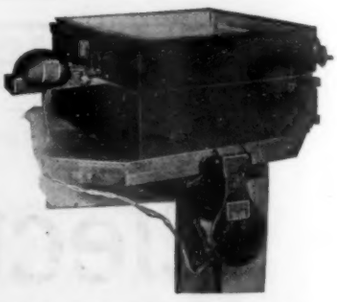

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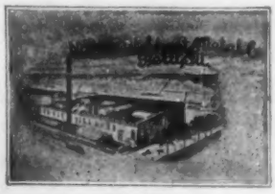

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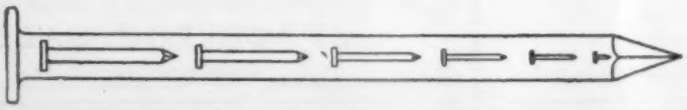

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FOR SALE—Hawley Schwartz Oil Fired Brass Melting Furnaces.

2—90" Class B. Unlined, have never been used. $500.00 each f. o. b. Buffalo, N. Y.

1—60" Class A, nearly new. Present lining used five days. $200.00 f. o. b. Kenosha, Wis. Address

A. B. C., Care of THE METAL INDUSTRY.

BRASS FOUNDRY

FOR SALE—Brass Foundry and Machine Shop. This is a very modern foundry and machine shop with a capacity of 6,000 pounds of brass castings per day. Located in southern part of the state of Michigan. Labor market exceedingly good. For particulars, address

D-11,
Care of THE METAL INDUSTRY.

MACHINERY

FOR SALE—3 spinning lathes, 1 large Thurston die milling machine, high speed sensitive ball bearing drilling machine, small sensitive bench drilling machine, 1 Schultz oval chuck, 1 new Grabo saw table. Address

D 2,
Care of THE METAL INDUSTRY.

GALVANIZING OUTFIT

FOR SALE—U. S. Electro Revolving Barrel Galvanizing outfit; tanks, solution, barrels, washer and generators complete.

E. G. BROOKE IRON COMPANY,
Birdsboro, Pa.

OIL FIRED FURNACES

FOR SALE—6 J. P. Smith Foundry Co. for Aluminum, 5 Monarch Non-Tilting for Brass. Price, $150.00 each. Send for photographs.
LUCAS & SON, 10 Fox Street, Bridgeport, Conn.

Second hand polishing lathes and used rag wheels. For sale cheap.
WALSH'S SONS & CO., Newark, N. J.

TUBING

FOR SALE—1000 to 1200 pieces Iron Boiler tubing, 60 inches long and 2⅞ inches inside diameter. Will be sold at a bargain. Address

BOX 1184,
CITY HALL STATION, NEW YORK CITY.

METAL

FOR SALE—1000 lbs. of Bronze in 1½" diameter cast bars. This material is brand new and up to Government specifications for gun metal.

C. SPIRO MFG. CO.,
61 E. 131st STREET, NEW YORK CITY.

Gentlemen: September 6, 1918.

Replying to yours of the 4th will say that sale of molding machine which we advertised in your August issue of "Metal Industry" was a direct result of the advertisement, and was purchased by a telegram from Seattle, Wash. This only goes to prove the "pulling power" of THE METAL INDUSTRY. Yours very truly,

MILWAUKEE VALVE COMPANY,
F. W. Mason, Secretary.

WANTED—EQUIPMENT, ETC.

Display Advertisements, One Column Wide, $3.00 Per Inch, Each Insertion

MACHINERY

WANTED—Two 3½ C Bliss toggle drawing presses; one Cincinnati shaper, one Cincinnati engine lathe, one Cincinnati miller. Address

ENTERPRISE ALUMINUM COMPANY,
Massillon, Ohio.

YELLOW TURNINGS

Wish to communicate with parties interested in running down yellow brass turnings into ingots by means of electric furnace. Address

ELECTRIC FURNACE,
Care of THE METAL INDUSTRY.

TRADE WANTS

AN EXCHANGE FOR THE WANTS OF THE METAL AND PLATING TRADES

ANSWERS SENT IN CARE OF THE METAL INDUSTRY WILL BE FORWARDED

INQUIRIES AND OPPORTUNITIES

Inquiries received by The Metal Industry for Metals, Machinery and Supplies. Further particulars may be obtained by addressing the inquiry number, care The Metal Industry. No charge for inserting these inquiries.

Inquiry 2167—Who makes machines for automatically polishing trench mirrors?

Inquiry 2168—Please give us the names of manufacturers of pressed brass automobile hub caps similar to the Chevrolet.

Inquiry 2169—We would appreciate the names of rollers of tin foil.

Inquiry 2170—Please put us in touch with manufacturers of double tinned mattress wire.

Inquiry 2171—We have trouble with a pyrometer tube used in galvanizing kettle. The zinc eats up the iron pipe. Where can we obtain a porcelain or other tube that could be used to remedy this?

Inquiry 2172—We want figures for a complete installation of an electrolytic copper plant for Spain.

Inquiry 2173—Please furnish us with names of all recently established sheet aluminum mills.

Inquiry 2174—Do you know of any foundry in the vicinity of New York that makes up cores for outside customers?

Inquiry 2175—Can you advise who manufactures Allorite metal?

Inquiry 2176—Where can I get a machine to block French sand for false core work?

Inquiry 2177—We contemplate erecting a factory and wish to provide ample space for nickel plating and japanning plant. Kindly recommend concerns that can furnish complete equipment.

Inquiry 2178—Who manufactures Hardenite, also Duke's metal?

Inquiry 2179—What concerns nickelize sheet steel?

Inquiry 2180—Who would be interested in a large deposit of tripoli in Quebec?

Inquiry 2181—We are going to add a brass foundry to our present equipment, and will be in need of furnaces, core ovens, shanks, tongs, flasks, moulding machines, etc. If you have the space to spare in your forthcoming issue to mention this it may be helpful in introducing us to some of your advertising friends, to the common advantage of us all.

SITUATIONS OPEN

Display Advertisements, One Column Wide, $3.00 per inch, Each Insertion. Undisplayed, 40 Cents per Line.

SUPERINTENDENT

WANTED—Man with a number of years' experience in the manufacture of small copper, brass and bronze tubes. Splendid opportunity for the right man, who must be capable of taking charge of this department of our business and helping it to grow, and as it does grow his compensation would be increased accordingly. Plant located in the central part of New York State, in a city of approximately one hundred thousand population. Address

SMALL COPPER TUBING,

Care of THE METAL INDUSTRY.

SUPERINTENDENT OR FOREMAN

WANTED—Mr. Superintendent or Foreman, do you feel that you have the ability to handle a larger and more remunerative job with opportunity for interest in the business? If your trade is brass, bronze and aluminum castings we have that position to offer. Write us,

L. J. F.,
Care of THE METAL INDUSTRY.

SUPERINTENDENT

WANTED—Superintendent for smelting and refining plant located in the Middle West manufacturing ingot brass and white metals; must understand making mixtures and know how to handle men. Address

N 5,
Care of THE METAL INDUSTRY.

METALLURGICAL CHEMIST

WANTED—Familiar with treatment and analysis of non-ferrous metals to take charge of metals and melting room of die casting plant. Must be technical graduate and have plenty of initiative. Excellent opportunity for young man with growing concern. Write fully, giving experience, age, schooling, and salary expected.

P. O. DRAWER 47,
SYRACUSE, N. Y.

SALESMAN

WANTED—Live wire, experienced in plating and polishing supplies; with trade following preferred. Address

D 4,
Care of THE METAL INDUSTRY.

BRASS ROLLERS

On sheet and breaking down rolls; steady work; good pay. Apply

MANHATTAN BRASS CO.,
332 East 28th Street, New York City.

BRASS MELTER

WANTED—Brass melter thoroughly experienced to take charge of 8 pit furnaces, good working conditions, steady and permanent work, Philadelphia district; state experience, last employer and wages expected. Address

D 5,
Care of THE METAL INDUSTRY.

PLATER

WANTED—Plater. Assistant foreman, one capable of handling help and with some experience on plating die cast metal. State age, experience and salary expected. Address

DIE-CAST,
Care THE METAL INDUSTRY.

TRADE WANTS

AN EXCHANGE FOR THE WANTS OF THE METAL AND PLATING TRADES

ANSWERS SENT IN CARE OF THE METAL INDUSTRY WILL BE FORWARDED

SITUATIONS OPEN—Continued

Display Advertisements, One Column Wide, $3.00 per inch, Each Insertion. Undisplayed, 40 Cents per Line.

BRASS FOUNDRY WORKING FOREMAN

WANTED—Working Foreman who is familiar with jobbing work and who has had experience with crucible and non-crucible oil furnaces. Applicants state experience, age and salary necessary at start. Steady employment and guaranteed advancement to capable man. Address

D 6,
Care of THE METAL INDUSTRY.

FOREMAN PLATER

WANTED—A foreman for up-to-date plating room. Also competent to supervise buffing and polishing departments. State age, experience, family, and minimum salary or wage expected. Address

D 1,
Care of THE METAL INDUSTRY.

FIRST-CLASS PLATER

WANTED—A first-class foreman plater who thoroughly understands still tank plating, automatic plating machine work and barrel plating. Also who is familiar with chemical or pigment finishes. A good position for the right man. Address

D 10,
Care of THE METAL INDUSTRY.

METAL SPINNER and PLATER

WANTED—Metal Spinner on Brass and small Silver, also Jobbing Plater on Church and Chandelier Work. State experience and wages.

WRIGHT MFG. CO.,
133 MASTER ST., PHILADELPHIA, PA.

SITUATIONS WANTED

Display Advertisements, One Column Wide, $3.00 per Inch, Each Insertion. Undisplayed, 40 Cents Per Line.

BRASS MILL SUPERINTENDENT

SITUATION WANTED—A brass mill superintendent with extensive and successful experience with leading mills only, desires correspondence with parties requiring services of a first class executive, a resourceful expert on rolling and drawing of flat metal and rods. Accustomed to handle costs and maintenance of plant. Address

D 8,
Care of THE METAL INDUSTRY.

Brass Foundry Superintendent or General Foreman

SITUATION WANTED—Present contract expires January 1st, and am seeking a new connection. Can handle any kind of a proposition up to 300 men, on machine, bench and floor work up to 2,000 lbs. Up-to-date on melting furnaces. Can go out and get work, estimate from prints. Am 39 years old. 20 years on brass. Address

D 9, Care of THE METAL INDUSTRY.

FOUNDRY

SITUATION WANTED—Superintendent or general foreman of brass machine shop, thoroughly experienced in up-to-date methods of manufacturing plumbers' supplies, auto parts and steam specialties. Practical toolmaker and brass finisher; first class references. Address D-7, care of THE METAL INDUSTRY.

SITUATION WANTED—By a Brass Foundry Foreman. Experienced molder, good metal mixer. Have been employed by some of the best foundries in the country. Prefer open shop on jobbing work. Will go anywhere for the right job. Good references. Address H. W. E., care THE METAL INDUSTRY.

SITUATION WANTED—As Foreman, by young man who has had seven years' practical experience in the manufacture of brass and bronze bushings, babbitt lined bearings, and one year's experience in a munition plant. Have held executive positions for the past four years. Can handle labor satisfactorily. Available at once. Address D-3, care of THE METAL INDUSTRY.

ELECTRO-PLATERS

Anyone desiring the services of first-class men for the electro-deposition of metals and finishing in all branches and departments of the plating business can secure such services by corresponding with the Secretary of the American Electro-Platers Society.

OSCAR E. SERVIS,
5305 Warner Avenue — Chicago, Ill.

PLATERS AND POLISHERS

SITUATION WANTED—Plater, Buffer and Polisher foreman with initiative and executive ability for profitable results, wants position of trust, familiar with the making of all plating solutions and finishes for any line of work prevailing in job shops or manufacturing plants. Can also take charge of painting, enameling and japanning. Address Jos. Bernath, care Y. M. C. A. 222 Bowery, New York City.

SITUATION WANTED—Foreman Plater, 22 years' experience in all general lines of Electro-plating and Polishing, Enameling and Spray Work, Tumbling and Burnishing Barrels. Address S-2, care THE METAL INDUSTRY.

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

Abrasives (See also Plating and Polishing Supplies).
Alden Speare's Sons Co., Cambridge, Mass.
Crown Rheostat & Supply Co., Chicago, Ill.
Handy & Harman, New York.
L'Hommedieu, Chas. F., & Son, Co., Chicago, Ill.
Norton Co., Worcester, Mass.
Rhodes, Jas. H., Co., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.

Accumulators, Hydraulic.
Watson-Stillman, Co., New York.

Acid, Sulphuric.
New Jersey Zinc, New York.

Acids (See Platers' Supplies).

Acid-Proof Stoneware.
General Ceramics Co., New York.

Air Brushes, Filters and Accessories.
De Vilbiss Mfg., Toledo, O.
Eclipse Air Brush Co., Newark, N. J.
Economy Mfg. Co., Chicago, Ill.
Eureka Pneumatic Spray Co., Inc., New York.
Holton, B. E., Co., Los Angeles, Cal.
Ideal Air Brush Co., New York.

Air Compressors.
De Vilbiss Mfg. Co., Toledo, O.
Eclipse Aid Brush Co., Newark, N. J.
Eureka Pneumatic Spray Co., Inc., New York.
Leiman Bros., New York.
Pangborn Corporation, Hagerstown, Md.

Alloys, Boronic All-Metal.
American Boron Products Co., Reading Pa.

Alloys Made to Specifications.
Birkenstein, S., & Sons, Chicago, Ill.
Columbia Smelting & Refining Works, New York.
Damascus Bronze Co., Pittsburgh, Pa.
Electric Smelting & Alum'n Co., Lockport, N. Y.
Metal & Thermit Corp., New York.
Michigan Smelting & Refining Co., Detroit, Mich.
Ney, The J. M., Company, Hartford, Conn.
North American Smelting Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.
Standard Rolling Mills Inc., Brooklyn, N. Y.
Union Smelting & Refining Co., Inc., Newark, N. J.
United Smelting & Aluminum Co., Inc., New Haven, Conn.

Aluminum Alloys.
Aluminum Co. of America, Pittsburgh, Pa.
Birkenstein, S., & Sons, Chicago, Ill.
Electric Smelting & Alum'n Co., Lockport, N. Y.
Seligman, Arthur, New York.
United Smelting & Aluminum Co., Inc., New Haven Conn.

Aluminum, Boronic All-Metal.
American Boron Products Co., Reading, Pa.

Aluminum Bronze Ingots.
Electric Smelting & Alum'n Co., Lockport, N. Y.

Aluminum Castings.
Aluminum Company of America, Pittsburgh, Pa.
Light Mfg. & Foundary Co., Pottstown, Pa.
Mueller Metals Co., Port Huron, Mich.

Aluminum, Cleaners of
Oakley Chemical Co., New York.

Aluminum Electrical Conductors.
Aluminum Company of America, Pittsburgh, Pa.
British Aluminum Co., Ltd., Toronto, Canada.

Aluminum Granulated.
United Smelting & Aluminum Co., Inc., New Haven, Conn.

Aluminum Ingots.
Aluminum Company of America, Pittsburgh, Pa.
Electric Smelting & Alum'n Co., Lockport, N. Y.
Great Western Smtg. & Ref'g. Co., St. Louis, Mo.
Leygrand & Co., Inc., New York.
Nassau Smtg. and Rfg. Works, New York.
Strahs Metals Co., New York City.
United Smelting & Aluminum Co., Inc., New Haven, Conn.
U. S. Reduction Co., E. Chicago, Ind.

Aluminum Machine Products.
Mueller Metals Co., Port Huron, Mich.

Aluminum Match Plates.
United Smelting & Aluminum Co., Inc., New Haven, Conn.

Aluminum Moldings and Extruded Shapes.
Aluminum Company of America, Pittsburgh, Pa.

Aluminum Powder, Leaf and Foil.
Aluminum Company of America, Pittsburgh, Pa.
Kemp, W. H., Co., New York.
Leygrand & Co., Inc., New York.
United Smelting & Aluminum Co., Inc., New Haven, Conn.

Aluminum Sheets, Rods, Coils and Wire.
Aluminum Company of America, Pittsburgh, Pa.
British Aluminum Co., Ltd., Toronto, Canada.
Electric Smelting & Alum'n Co., Lockport, N Y.
Kemp, W. H., Co., New York.
Leygrand & Co., Inc., New York.
Strahs Metals Co., New York City.
United Smelting & Aluminum Co., Inc., New Haven, Conn.

Aluminum Solder (See Solder).

Aluminum Tubes.
Aluminum Company of America, Pittsburgh, Pa.

Aluminum Welding.
United Smelting & Aluminum Co., Inc., New Haven, Conn.

"Alundum" and "Crystolon."
Norton Co., Worcester, Mass.

Ammeters and Voltmeters (See Platers' Supplies).

Amyl Acetate (See Platers' Supplies).
Du Pont Chemical Works, New York.

Angle & Straight Stem Thermometers.
Taylor Instrument Companies, Rochester, N. Y.

Annealing Muffles.
Metals Production Equipment Co., New York.

Anodes, Brass, Copper or Nickel (See also Platers' Supplies).
Apothecaries Hall Co., Waterbury, Conn.
Crown Rheostat & Supply Co., Chicago, Ill.
Ely, C. Upham, New York.
General Platers' Supply Co., New York.
Hanson & Van Winkle Co., Newark, N. J.
Harshaw, Fuller & Goodwin Co., Cleveland, O.
Hussey, C. G., & Co., Pittsburgh, Pa.
L'Hommedieu, Chas. F., & Sons, Chicago, Ill.
Munning, A. P., & Co., New York and Chicago.
National Anode Co., Passaic, N. J.
National Galvanizing & Plating Equipment Corp., New York.
Seymour Manufacturing Co., The, Seymour, Conn.
Stevens, Frederic B., Detroit, Mich.

Anodes, Gold and Silver.
Ney, J. M., Company, Hartford, Conn.

Anodes, Gold.
Handy & Harman, New York.
Jackson, John J., Newark, N. J.

Anodes, Platinum.
Roessler & Hasslacher Chemical Co., New York.

Anodes, Silver (See also Platers' Supplies).
Handy & Harman, New York.

Anodes, Zinc (See also Platers' Supplies).
Apothecaries Hall Co., Waterbury, Conn.
Galvanizing Corp. of America, Brooklyn, N. Y.
Hanson & Van Winkle Co., Newark, N. J.
Munning, A. P., & Co., New York and Chicago.

Antimonial Lead.
United Smelting & Aluminum Co., Inc., New Haven, Conn.

Antimony Metal.
Birkenstein, S., & Sons, Chicago, Ill.
Leavitt, C. W., Co., New York.

Arc and Incandescent Lamps.
General Electric Co., Schenectady, N. Y.

Assayers and Chemists.
Ledoux & Co., New York.
Ricketts & Co., New York.
Thomson, S. H., Chemical Laboratories, Dayton O.

Automatic Dipping Baskets.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Automatic Pickling and Cleaning Machinery
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Automatic Plating Barrels.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Automatic Plating Machines.
Connecticut Dynamo & Motor Co., Irvington, N. J.

Automatic Straightening & Cutting Machinery.
Shuster, The F. B., Co., New Haven, Conn.

Babbitt Metals.
Ajax Metal Co., Philadelphia, Pa.
American Boron Products Co., Reading, Pa.
Electric Smelt. & Aluminum Co., Lockport, N. Y.
Great Western Smtg. & Ref'g Co., St. Louis, Mo.
Richards & Co., Boston, Mass.
Syracuse Smelting Works, Brooklyn, N. Y.
United Smelting & Aluminum Co., New Haven, Conn.
U. S. Reduction Co., E. Chicago, Ind.
White & Bro., Philadelphia, Pa.

Babbitt Molds.
Schweizer, Chas K., Co., St. Louis, Mo.

Baking Ovens.
Steiner, E., & Co., Newark, N. J.

Baling Presses (See Cabbaging Presses).

Balls, Steel, for Burnishing.
Abbott Ball Co., Hartford, Conn.
Baird Machine Co., Bridgeport, Conn.
Globe Machine & Stamping Co., Cleveland, O.
Smith, Richardson Co., Attleboro, Mass.

Block Tin (See Tin).

Blowers and Blow Piping.
Astle, H. J., & Co., Providence, R. I.
Cleveland Blow Pipe & Mfg. Co., Cleveland, O.
Leiman Bros., New York.
Maxon Premix Burner Co., Muncie, Ind.
New Haven Sand Blast Co., New Haven, Conn.

Bolt Heading, Trimming and Threading Machines.
Webster & Perks Tool Co., Springfield, O.

Boiler Insulation.
Armstrong Cork & Insulation Co., Pittsburgh, Pa.
Quigley Furnace Specialties Co., Inc., New York.

Boiler Settings.
Clinton Metallic Paint Co., Clinton, N. Y.
Quigley Furnace Specialties Co., Inc., New York.

Bonding Material (Fire Brick Cement).
Clinton Metallic Paint Co., Clinton, N. Y.
Pecora Paint Co., Philadelphia, Pa.
Quigley Furnace Specialties Co., Inc., New York.

Brass Briquet-Ingots.
Eastern Brass & Ingot Corp., Waterbury, Conn.

Brass, Bronze and Composition Ingots and Castings.
American Brass Co., Waterbury, Conn.
Ajax Metal Co., Philadelphia, Pa.
Great Western Smtg. & Ref'g Co., St. Louis, Mo.
Hegt, Herman J., New York.
Herscopf & Son, Co., Brooklyn, N. Y.
Lake Erie Smelting & Refining Co., Cleveland, O.
Michigan Smelting & Refining Co., Detroit, Mich.
Precision Casting Co., Syracuse, N. Y.
Richards & Co., Boston, Mass.
Seligman, Arthur, New York.
Silvel Metal Co., New York.
United Smelting & Aluminum Co., Inc., New Haven, Conn.
White & Bro., Inc., Philadelphia, Pa.

Brass, Bronze, Copper, Nickel Silver or Cupro-Nickel Sheet, Wire, Rod, Tubes, Etc.
American Brass Co., The, Waterbury, Conn.
Benson, H. K. & F. S., Glen Ridge, N. J.
Bridgeport Brass Co., Bridgeport, Conn.
Bristol Brass Co., Bristol, Conn.
Brown's Copper & Brass Rolling Mills, Ltd., New Toronto, Canada.
Cleveland Brass & Copper Mills, Inc., Cleveland, Ohio.
Continuous Casting Corporation, Garwood, N. J.
Dallas Brass & Copper Co., Chicago, Ill.
Dueber Watch Case Mfg. Co., Canton, O.
Hegt, Herman J., New York.
Hussey, C. G., & Co., Pittsburgh, Pa.
Manhattan Brass Co., New York.
Metals Production Equipment Co., New York.
Metals Trading Corporation, New York.
Mueller Metals Co., Port Huron, Mich.
National Brass & Copper Co., Lisbon, O.
National, The, Co., Waterbury, Conn.
New Jersey Tube Co., Harrison, N. J.
Rome Hollow Wire & Tube Co., Rome, N. Y.
Rome Wire Co., Rome, N. Y.
Scovill Manufacturing Co., Waterbury, Conn.
Stimpson, E. B., Co., Brooklyn, N. Y.
Taunton-New Bedford Copper Co., New Bedford, Mass.
Trumpbour-Whitehead Co., New York.
Winchester, B. & C. Co., West Winsted, Conn.

Brass and Bronze Founders.
American Brass Products Co., Pottstown, Pa.
Mueller Metals Co., Port Huron, Mich.
National Cash Register Co., Dayton, Ohio.

Brass and Copper Tubes.
Mueller Metals Co., Port Huron, Mich.
Wheeler Condenser & Engineering Co., Carteret, N. J.

Brass Discs, Cups, Etc.
Brown's Copper & Brass Rolling Mills, Ltd., New Toronto, Canada.
Metals Trading Corporation, New York.
New Jersey Tube Co., Newark, N. J.

Brass Foundry Equipment (See Foundry Supplies and Equipment).

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

Brass Mill Machinery.
Continuous Casting Corporation, Garwood, N. J.
Garrison, A., Fdy. & Machine Co., Pittsburgh, Pa.
Torrington Mfg. Co., Torrington, Conn.
Waterbury (Conn.) Farrel Fdy. & Machine Co.

Brick, Cork Paving.
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

Brick Insulating.
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

Brinell Hardness Testing Instruments.
Hois, Herman A., New York.

Briquet-Ingots.
Eastern Brass & Ingot Corp., Waterbury, Conn.

Briquetting Machines.
Eastern Brass & Ingot Corp., Waterbury, Conn.
General Briquetting Co., New York.

Britannia Metal.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Bronze Castings,, Ornamental.
American Bronze Novelty Works, Inc., New York.

Bronze Powder.
Dupont Chemical Co., New York.

Bronze Sheets, Wire Rods, Etc. (See Brass, Bronze and Copper Sheets, Etc.).

Bronze Tubes (See Brass, Bronze and Copper Tubes).

Bronze & Composition Ingots & Castings.
Seligman, Arthur, New York.
Whipple & Choate, Bridgeport, Conn.

Brushes, Wire and Bristle (See also Foundry Supplies and Platers' Supplies).
Blumenthal, H., & Co., New York.
Brooklyn Scratch Brush Co., Brooklyn, N. Y.
Hanson & Van Winkle Co., Newark, N. J.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Paxson, J. W., Co., Philadelphia, Pa.

Buffing and Polishing Composition (See also Platers', Polishers' and Galvanizers' Supplies).
Apothecaries Hall Co., Waterbury, Conn.
Bennett-O'Connell Co., Chicago, Ill.
Burns, E. Reed, Brooklyn, N. Y.
Crown Rheostat & Supply Co., Chicago, Ill.
Gaylord, Charles H., Chicago, Ill.
General Platers' Supply Co., New York.
Hanson & Van Winkle Co., Newark, N. J.
Munning, A. P., & Co., New York and Chicago.
Rhodes, Jas. H., Co., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Wiarda & Co., John C., Brooklyn, N. Y.
Woodison, E. J., Co., Detroit, Mich.

Buffing and Polishing Wheels.
Woodison, E. J., Co., Detroit, Mich.

Buffs (See Platers' and Polishers' Supplies).

Burners, Enclosed Flame Gas.
Gehnrich Indirect Heat Oven Co., Brooklyn, N. Y.

Burners, Fuel Oil or Gas (See also Foundry Supplies).
Hausfeld Co., Harrison, Ohio.
Hawley Down Draft Furnace Co., Easton, Pa.
Maxon Premix Burner Co., Muncie, Ind.
Metals Production Equipment Co., New York.
Monarch Eng. & Mfg. Co., Baltimore, Md.

Burners, Powdered Coal.
Quigley Furnace Specialties Co., Inc., New York.

Burners, Premix.
Maxon Premix Burner Co., Muncie, Ind.
Monarch Engineering & Mfg. Co., Baltimore, Md.

Burnishing Barrels (See also Platers' Supplies).
Abbott Ball Co., Hartford, Conn.
Crown Rheostat & Supply Co., Chicago, Ill.
Globe Machine & Stamping Co., Cleveland, O.
Hanson & Van Winkle Co., Newark, N. J.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Munning-Loeb Co., Matawan, N. J.
Smith, Richardson Co., Attleboro, Mass.

Burnishing Compounds and Chips (See also Platers' and Polishers' Supplies).
International Chemical Co., Camden, N. J.
Oakley Chemical Co., New York.

Cabbaging Presses.
General Briquetting Co., New York.

Calcium-Copper Alloys.
American Magnesium Corp., Niagara Falls, N. Y.

Carbonate of Potash.
Roessler & Hasslacher Chemical Co., New York.

Carboy Rockers.
Munning, A. P., & Co., New York and Chicago.

Case Hardening Materials.
Buchanan, C. G., Chemical Co., Cincinnati, O.

Castings (See name of metal wanted).

Castings, Brass, Bronze, Etc. (See also Brass Foundries).
National Cash Register Co., Dayton, Ohio.

Castings—Die Moulded.
Acme Die Casting Corp., Brooklyn, N. Y.

Castings, Iron Machinery.
Metals Production Equipment Co., New York.

Caustic Potash (See Platers', Polishers' and Galvanizers' Supplies).

Caustic Soda, Soda Ash, Etc.
Solvay Process Co., Syracuse, N. Y.

Cement Fire Brick.
Pecora Paint Co., Philadelphia, Pa.
Quigley Furnace Specialties Co., Inc., New York.

Cement, Furnace, High Temperature.
American Fire Cement Co., Lewiston, Me.
Quigley Furnace Specialties Co., Inc., New York.

Cement, Furnace and Fire Brick, High Temperature.
Clinton Metallic Paint Co., Clinton, N. Y.
Hausfeld Co., Harrison, Ohio.
Pecora Paint Co., Philadelphia, Pa.

Cement, Insulating.
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

Centrifugal Dryers and Extractors.
Tolhurst Machine Works, Troy, N. Y.

Chemicals (See Platers' Supplies).

Chemists.
Ledoux & Co., New York.

Chloride of Iron.
Roessler & Hasslacher Chemical Co., New York.

Chucks, Oval.
Pryibil, P., Machine Co., Inc., New York.

Chucks, Spinning.
Pryibil, P., Machine Co., Inc., New York.

Cinder Mills, Water (See Crushers, Cinder).
Solvay Process Co., Syracuse, N. Y.

Cleaning Compounds for Metals (See also Platers Supplies).
Anthony, H. M., & Co., New York.
Bennett-O'Connell Co., Chicago, Ill.
Crown Rheostat & Supply Co., Chicago, Ill.
Electric Smelt. & Aluminum Co., Lockport, N. Y.
Ford, J. B., Co., Wyandotte, Mich.
Fuller, W. A., Co., Greensburg, Pa.
General Platers' Supply Co., New York.
Hanson & Van Winkle Co., Newark, N. J.
International Chemical Co., Camden, N. J.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Munning, A. P., & Co., New York and Chicago.
Oakley Chemical Co., New York.
Solvay Process Co., Syracuse, N. Y.
Stevens, Frederic B., Detroit, Mich.

Cock Grinders, Automatic.
Turner Machine Co., Philadelphia, Pa.

Compositions, Buffing (See Platers' Polishers' and Galvanizers' Supplies).

Composition, Flooring.
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

Composition Metal Ingots and Castings.
Richards & Co., Boston, Mass.

Compressors, Centrifugal, Air and Gas.
General Electric Co., Schenectady, N. Y.

Concentrating Tables.
James Ore Concentrator Co., Newark, N. J.

Consulting Platers (See Expert Instruction).

Copper-Aluminum, Boronic All-Metal.
American Boron Products Co., Reading, Pa.

Copper, Boronic All-Metal.
American Boron Products Co., Reading, Pa.

Copper, Carbonate of.
Munning, A. P., & Co., New York and Chicago.
Wiarda & Co., John C., Brooklyn, N. Y.

Copper Castings.
Ajax Metal Co., Philadelphia, Pa.
National Anode Co., Passaic, N. J.

Copper-clad Wire, Rod, Etc.
Standard Underground Cable Co., Pittsburgh, Pa.

Copper Cyanide.
Apothecaries Hall Co., Waterbury, Conn.
Cooper, Charles, & Co., New York.

Copper, Electrolytic.
United States Smelting, Refining & Mining Co., Inc., New York.

Copper Ingots.
Balbach Smelting & Refining Co., Newark, N. J.
Baltimore Copper Smelt. & Rolling Co., New York.
Hendricks Bros., New York.
Lake Erie Smelting & Refining Co., New York.
Richards & Co., Boston, Mass.
Trotter, Nathan, & Co., Philadelphia, Pa.
United Metals Selling Co., New York.
United Smelting & Aluminum Co., Inc., New Haven, Conn.
White & Bros., Inc., Philadelphia, Pa.

Copper and Composition Nails, Tacks and Rivets.
Hussey, C. G., & Co., Pittsburgh, Pa.
Scovill Manufacturing Co., Waterbury, Conn.
Stimpson, E. B., Co., Brooklyn, N. Y.

Copper-Nickel, Boronic All-Metal.
American Boron Products Co., Reading, Pa.

Copper Sheet, Wire, Rods, Bolts, Etc. (See Brass, Bronze and Copper Sheets, Etc.)

Copper Tubes (See Brass and Copper Tubes)

Copper and Yellow Brass Rod.
Mueller Metals Co., Port Huron, Mich.

Core Compound (See also Foundry Supplies)
Stevens, Frederic B., Detroit, Mich.

Core Machines (See Foundry Supplies).
Stevens, Frederic B., Detroit, Mich.
Wadsworth Core Machine & Equip. Co., Akron, O.

Core Making Machines.
Brown Specialty Machinery Co., Chicago, Ill.

Core Oil.
Paxson, J. W., Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.

Core Oven Insulation.
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

Core Ovens (See also Foundry Supplies)
Metals Production Equipment Co., New York.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer, The S., Co., Pittsburgh, Pa.
Stevens, Frederic B., Detroit, Mich.
Wadsworth Core Machine & Equip. Co., Akron, O.

Core Tapering Machines.
Brown Specialty Machinery Co., Chicago, Ill.

Core Trays Steel.
Wadsworth Core Machine & Equip. Co., Akron, O.

Countershafts Ball Bearing.
Gardner Machine Co., Beloit, Wis.

Coverings, Pipe and Boiler, High Pressure Steam.
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

Covering, Pipe, Cold Water, Ice Water and Brine.
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

Cranes.
Northern Engineering Works, Detroit, Mich.

Crucibles, Stirrers, Stoppers, Nozzles, Etc. (See also Foundry Supplies).
Bartley, Jonathan, Crucible Co., Trenton, N. J.
Dixon, Jos., Crucible Co., Jersey City, N. J.
Foreign Crucible Corporation, Ltd., New York.
Gautier, J. H., & Co., Jersey City, N. J.
General Platers' Supply Co., New York.
Leygrand & Co., Inc., New York.
McCullough-Dalzell Crucible Co., Pittsburgh, Pa.
Obermayer, The S., Co., Pittsburgh, Pa.
Seidel, R. B., Inc., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Taylor, R. J., Inc., Philadelphia, Pa.
Vesuvius Crucible Co., Swissvale, Pa.

Crucibles, Tongs.
N. J. Foundry & Machine Co., New York.

Crushers, Cinder (See also Foundry Supplies).
Eastern Machinery Co., New Haven, Conn.
James Ore Concentrator Co., Newark, N. J.
Obermayer, The S., Co., Pittsburgh, Pa.
Standard Equipment Co., New Haven, Conn.

Cupels.
Dixon, Jos., Crucible Co., Jersey City, N. J.

Curtis Steam Turbines.
General Electric Co., Schenectady, N. Y.

Cutting & Straightening Machinery, Strip Metal & Wire.
Shuster, The F. B., Co., New Haven, Conn.

Cyanide of Potassium (See Platers' Supplies).

Cyanide of Sodium (See Platers' Supplies).

Dental Golds and Solders.
Ney, The J. M., Co., Hartford, Conn.

Deoxidizers for Metals.
American Boron Products Co., Reading, Pa.
Obermayer, The S., Co., Pittsburgh, Pa.

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

Die Castings—All Metals.
Acme Die Casting Corp., Brooklyn, N. Y.

Die Castings, Brass and Bronze.
Doehler Die Casting Co., Brooklyn, N. Y.
Mueller Metals Co., Port Huron, Mich.

Die Castings, White Metal, Aluminum, Etc.
Doehler Die Casting Co., Brooklyn, N. Y.
Light Mfg. & Foundry Co., Pottstown, Pa.
Mueller Metals Co., Port Huron, Mich.
Precision Castings Co., Inc., Syracuse, N. Y.

Dies, Sheet Metal Working.
Bliss, E. W., Co., Brooklyn, N. Y.
Standard Metal Goods Mfg. Co., New York.

Dipping Baskets.
Crown Rheostat & Supply Co., Chicago, Ill.

Dipping Baskets, Automatic.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Dipping Baskets, Wire.
Driver-Harris Co., Newark, N. J.
Smith, John P., & Co., New Haven, Conn.

Dipping Baskets (Nichrome).
Driver-Harris Co., Harrison, N. J.

Disc Polishing and Grinding Machines.
Gardner Machine Co., Beloit, Wis.

Draw Benches, Wire, Rod and Tube.
Continuous Casting Corporation, Garwood, N. J.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.
Wolffgram, L., Erie, Pa.

Drinking Water Systems.
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

Drop Hammers.
Bliss, E. W., & Co., Brooklyn, N. Y.

Drosses (See Metal Turnings, Drosses, Etc.)

Drying-Out Machines.
Astle, H. J., & Co., Providence, R. I.
No-Dust Drying Machine Co., Providence, R. I.
Smith, Richardson Co., Attleboro, Mass.
Tolhurst Machine Works, Troy, N. Y.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Dust Collectors and Ventilating Systems.
Cleveland Blow Pipe & Mfg. Co., Cleveland, O.
Kirk & Blum Co., Cincinnati, O.
Leiman Bros., New York.
Paxson, J. W., Co., Philadelphia, Pa.

Dust Exhauster—Arrester Systems.
Pangborn Corporation, Hagerstown, Md.

Dynamos, Platers' and Galvanizers' (See also Platers' Supplies).
Bennett-O'Connell Co., Chicago, Ill.
Bogue, Chas. J., Electric Co., New York.
Boissier Electric Co., New York City.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Crown Rheostat & Supply Co., Chicago, Ill.
Eager Electric Co., Watertown, N. Y.
General Platers' Supply Co., New York.
Hanson & Van Winkle Co., Newark, N. J.
Jants & Leist Co., Cincinnati, O.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
National Galvanizing & Plating Equipment Corporation, New York.
Stevens, Frederic B., Detroit, Mich.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Electric Cleaners.
Oakley Chemical Co., New York.

Electric Cleaning Compounds (See Cleaning Compounds, Metal).

Electric Glue Pots.
Advance Machinery Co., Van Wert, Ohio.

Electrical Supplies.
General Electric Co., Schenectady, N. Y.

Electrogalvanizing Equipment (See Galvanizing Equipment).

Electroplaters Centrifugal Dryers.
Tolhurst Machine Works, Troy, N. Y.

Electro-Plating Supplies.
Crown Rheostat & Supply Co., Chicago, Ill.

Electroplating of Aluminum.
United Smelting & Aluminum Co., Inc., New Haven, Conn.

Electroplating Equipment (See Platers' Polishers' and Galvanizing Equipment and Supplies).

Electroplating, Polishing, Coloring, Etc.
Enterprise Electro Plating & Mfg. Co., Detroit, Mich.
Haas, Henry, & Son, New York.
Hassall, John, Inc., Brooklyn, N. Y.
Stimpson, E. B., Co., Brooklyn, N. Y.
Terrace Electric Plating Co., New York.

Emery.
Alden Speare's Sons Co., Cambridge, Mass.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Norton Company, Worcester, Mass.
Rhodes, Jas. H., & Co., Chicago, Ill.

Emery Wheel Dressing Machine.
Divine Brothers Co., Utica, N. Y.
Webster & Perks Tool Co., Springfield, Ohio.

Enamels for Metals, Wood, Etc.
Hilo Varnish Corporation, Brooklyn, N. Y.

Enamels, Military.
Hilo Varnish Corporation, Brooklyn, N. Y.

Enamels, White.
Hilo Varnish Corporation, Brooklyn, N. Y.

Enameling and Japanning Ovens.
General Electric Co., Schenectady, N. Y.
Steiner, E., & Co., Newark, N. J.

Engineers, Foundry.
Brown Specialty Machinery Co., Chicago, Ill.

Engineers, Furnace.
Monarch Engineering & Mfg. Co., Baltimore, Md.

Engraved Stem Thermometers.
Taylor Instrument Companies, Rochester, N. Y.

Escutcheon Pins, All Metals.
Hassall, John, Inc., Brooklyn, N. Y.
Stimpson, E. B., Brooklyn, N. Y.

Equipment Control for Motors.
General Electric Co., Schenectady, N. Y.

Ethyl Acetate.
Du Pont Chemical Works, New York.

Exhaust Fans and Heads (See Dust Collectors, Etc.).
Cleveland Blow Pipe & Mfg. Co., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Kirk & Blum Co., Cincinnati, O.
Pangborn Corporation, Hagerstown, Md.

Explosives.
Atlas Powder Co., Wilmington, Del.
E. I. du Pont de Nemours & Co., Wilmington, Del.

Extruded Metal Shapes.
Bristol Brass Co., Bristol, Conn.

Felt Polishing Wheels.
Divine Bros. Co., Utica, N. Y.
Eastern Felt Co., Winchester, Mass.
Munning, A. P., & Co., New York and Chicago.
Rhodes & Co., Jas. H., Chicago, Ill.

Felt Sheets.
Eastern Felt Co., Winchester, Mass.

Fig Cleanser.
International Chemical Co., Camden, N. Y.

Fillets, Leather (See Foundry Supplies and Equiment).

Fire Brick Cement (See also Foundry Supplies).
Clinton Metallic Paint Co., Clinton, N. Y.
Pecora Paint Co., Philadelphia, Pa.
Quigley Furnace Specialties Co., Inc., New York.

Flasks, Brass Molders (See also Foundry Supplies).
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer, The S., Co., Pittsburgh, Pa.

Flint Shot.
U. S. Silica Co., Chicago, Ill.

Fluxes for Metals.
American Boron Products Co., Reading, Pa.
Obermayer, The S., Co., Pittsburgh, Pa.

Fluxes, Soldering and Tinning.
Allen, L. B., Co., Inc., Chicago, Ill.
Davis Process Co., Brooklyn, N. Y.

Forgings, Brass, Bronze, Aluminum, Nickel Silver.
Continuous Castings Corporation, Garwood, N. J.
Mueller Metals Co., Port Huron, Mich.
Scovill Mfg. Co., Waterbury, Conn.

Forgings, Drop.
Bliss, E. W., Co., Brooklyn, N. Y.

Foundry Facings (See also Foundry Supplies).
Obermayer, S., Co., Pittsburgh, Pa.
Paxson, J. W., Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Wagner, Alfred T., Detroit, Mich.
Woodison, E. J., Co., Detroit, Mich.

Foundry Riddles (See also Foundry Supplies and Equipment).
Brown Specialty Machinery Co., Chicago, Ill.

Foundry Supplies and Equiment (See also Foundry Facings, Furnaces, Etc.).
B. & B. Mfg. Co., Inc., Indianapolis, Ind.
Bartley, Jonathan, Crucible Co., Trenton, N. J.
Brown Specialty Machinery Co., Chicago, Ill.
Dings Magnetic Separator Co., Milwaukee, Wis.
Dixon, Jos., Crucible Co., Jersey City, N. J.
Eastern Machinery Co., New Haven, Conn.
Gautier, J. H., & Co., Jersey City, N. J.
Gehnrich Indirect Heat Oven Co., Brooklyn, N. Y.
Ideal Furnace Co., Chester, Pa.
James Ore Concentrator Co., Newark, N. J.
Magnetic Manufacturin Co., Milwaukee, Wis.
Manufacturers' Brush Co., Cleveland, O.
McCullough-Dalzell Crucible Co., Pittsburgh, Pa.
Metals Production Equipment Co., New York.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Paxson, J. W., Co., Philadelphia, Pa.
Pecora Paint Co., Philadelphia, Pa.
Seidel, R. B., Inc., Philadelphia, Pa.
Standard Equipment Co., New Haven, Conn.
Steiner, E. E., Newark, N. J.
Stevens, Frederic B., Detroit, Mich.
Taylor, R. J., Inc., Philadelphia, Pa.
U. S. Silica Co., Chicago, Ill.
Van Ommeren Corp., Ph., New York.
Vesuvius Crucible Co., Swissvale, Pa.
Wadsworth Core Machine & Equip. Co., Akron, O.
Wagner, Alfred T., Detroit, Mich.
Webster & Perks Tool Co., Springfield, Ohio.
Woodison, E. J., Co., Detroit, Mich.

Furnace Insulation.
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

Furnace Linings.
Monarch Engineering & Mfg. Co., Baltimore, Md.

Furnaces, Annealing, Brazing, Etc.
Metals Production Equipment Co., New York.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Rockwell, W. S., Co., New York.

Furnaces, Electric.
Detroit Electric Furnace Co., Detroit, Mich.

Furnace Engineers (See Engineers' Furnaces).

Furnaces, Galvanizing and Tinning.
Metals Production Equipment Co., New York.
Monarch Engineering & Mfg. Co., Baltimore, Md.

Furnaces, Melting, Electric.
Detroit Electric Furnace Co., Detroit, Mich.

Furnaces, Melting, for Oil, Coal, Coke or Gas (See also Foundry Supplies).
Hausfeld Co., Harrison, Ohio.
Hawley Down Draft Furnace Co., Easton, Pa.
Ideal Furnace Co., Chester, Pa.
Metals Production Equipment Co., New York.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Obermayer, The S., Co., Pittsburgh, Pa.
Paxson, J. W., Co., Philadelphia, Pa.
Rockwell, W. S., Co., New York.
Stevens, Frederic B., Detroit, Mich.

Furnaces, Powdered Coal Burning.
Metals Production Equipment Co., New York.
Quigley Furnace Specialties Co., Inc., New York.

Furnaces, Reverberatory.
Hawley Down Draft Furnace Co., Easton, Pa.
Monarch Engineering & Mfg. Co., Baltimore, Md.

Galvanized Specialties, Nails, Screws, Etc.
Galvanizing Corp. of America, Brooklyn, N. Y.
Hassall, John, Inc., Brooklyn, N. Y.
National Galvanizing & Plating Equipment Corporation, New York.

Galvanizing, Electro, Equipment.
Bennett-O'Connell Co., Chicago, Ill.
Galvanizing Corp. of America, Brooklyn, N. Y.
Hanson & Van Winkle Co., Newark, N. J.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Munning, A. P., & Co., New York and Chicago.
National Galvanizing & Plating Equipment Corporation, New York.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.
Wagner, Alfred T., Detroit, Mich.

Galvanizing Equipment, Hot.
New Standard Hardware Works, Inc., Mount Joy, Pa.
Watrous, E. L., Galvanizing Co., Des Moines, Ia.

Galvanizing for the Trade.
Enterprise Electro Plating & Mfg. Co., Detroit Mich.
Galvanizing Corp. of America, Brooklyn, N. Y.
Hassall, John, Inc., Brooklyn, N. Y.
Meaker Galvanizing Co., Chicago, Ill.
National Galvanizing, Plating & Equipment Co., New York.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Galvanizing, Hot.
Malleable Iron Fittings Co., Branford, Conn.
Watrous, E. L., Galvanizing Co., Des Moines, Ia.

Galvanizing Solution.
Galvanizing Corp. of America, Brooklyn, N. Y.

Gas Producers and Power Plants.
Wood, R. D., & Co., Philadelphia, Pa.

Generators, Electroplating.
General Electric Co., Schenectady, N. Y.

German Silver (See Nickel Silver).

Glue Pots.
Advance Machinery Co., Van Wert, Ohio.

BUYERS' GUIDE: ADVERTISERS' PRODUCTS

Gold Alloys.
American Boron Products Co., Reading, Pa.

Gold Anodes (See Anodes, Gold).

Gold, Boronic, All-Metal.
American Boron Products Co., Reading, Pa.

Gold, Ingots, Bars, Plates, Etc.
Handy & Harman, New York.

Gold and Silver Refiners.
Handy & Harman, New York.
Roessler & Hasslacher Chemical Co., New York.

Gold Trysalyt.
Roessler & Hasslacher Chemical Co., New York.

Grinding Machinery.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Divine Brothers Co., Utica, N. Y.
Gardner Machine Co., Beloit, Wis.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Norton Company, Worcester, Mass.
Stevens, Frederic B., Detroit, Mich.
Webster & Perks Tool Co., Springfield, Ohio.

Hardness Testing Instruments.
Hois, Herman A., New York.
Shore Instrument Co., New York.

"Heatpruf" Plastic Fire Cement.
Pecora Paint Co., Philadelphia, Pa.

Hoists, Air.
Northern Engineering Works, Detroit, Mich.

Hoists, Electric, Pneumatic, Hand.
Northern Engineering Works, Detroit, Mich.

Hoods for Polishing & Buffing Wheels.
Kirk & Blum Co., Cincinnati, Ohio.

Hot Galvanizing Machine.
Watrous, E. L., Galvanizing Co., Des Moines, Ia.

Hydraulic Machinery, Presses, Jacks, Etc.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.
Wood, R. D., & Co., Philadelphia, Pa.

Hydrometers.
Taylor Instrument Companies, Rochester, N. Y.

Hygrometers.
Taylor Instrument Companies, Rochester, N. Y.

Hytempite Fire Brick Cement.
Quigley Furnace Specialties Co., Inc., New York.

Index Thermometers.
Taylor Instrument Companies, Rochester, N. Y.

Industrial and Mine Electric Locomotives.
General Electric Co., Schenectady, N. Y.

Ingots, Brass-Briquet.
Eastern Brass & Ingot Corp., Waterbury, Conn.

Instruments.
General Electric Co., Schenectady, N. Y.

Insulating Brick.
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

Insulation, Boiler Setting, Furnace and Oven, Etc.
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

Insulation, Heat and Cold.
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

Insulation, Pipes, Hot and Cold.
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

Iron, Boronic All-Metal.
American Boron Products Co., Reading, Pa.

Iron and Steel Machine Products.
Mueller Metals Co., Port Huron, Mich.

Japans for all purposes.
Hilo Varnish Corporation, Brooklyn, N. Y.

Japanning.
Malleable Iron Fittings Co., Branford, Conn.

Japanning Ovens (See Enameling and Japanning Ovens).

Jewelers' Equipment and Supplies (See also Supplies).
Leiman Bros., New York.
New Haven Sand Blast Co., New Haven, Conn.
No-Dust Drying Machine Co., Providence, R. I.
Smith, Richardson Co., Attleboro, Mass.

Jewelers' Gold and Silver Solders.
Ney, The J. M., Company, Hartford, Conn.

Jewelers' Findings.
Smith, Richardson Co., Attleboro, Mass.

Job Galvanizing.
Galvanizing Corp. of America, Brooklyn, N. Y.

Kenetrous (High Voltage Rectifiers).
General Electric Co., Schenectady, N. Y.

Laboratories, Consulting.
Norton Laboratories, Inc., Lockport, N. Y.
Ricketts & Co., New York.

Lacquering Ovens (See Enameling Ovens).

Lacquer Sprayers (See Air Brushes, Etc.).
Paasche Air Brush Co., Chicago, Ill.

Lacquers, Colored.
Hilo Varnish Corporation, Brooklyn, N. Y.

Lacquers and Enamels (See also Platers' Supplies).
Apothecaries Hall Co., Waterbury, Conn.
Atlas Powder Co., Wilmington, Del.
Barrett, M. L., & Co., Chicago, Ill.
Celluloid Zapon Co., New York.
Dupont Chemical Works, New York.
Egyptian Lacquer Manufacturing Co., New York.
Hanson & Van Winkle Co., Newark, N. J.
Kalbfleisch Corporation, The, New York.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Munning, A. P., & Co., New York and Chicago.

Ladle Heaters and Dryers (See also Foundry Supplies).
Monarch Engineering & Mfg. Co., Baltimore, Md.

Ladles.
Monarch Engineering & Mfg. Co., Baltimore, Md.

Lathes, Brass, Finishers.
Webster & Perks Tool Co., Springfield, Ohio.

Lathes, Spinning.
Bliss, E. W., & Co., Brooklyn, N. Y.
Pryibil, P., Machine Co., Inc., New York.

Lead Castings, Antimonial.
North American Smelting Co., Philadelphia, Pa.

Lead, Pig and Bar.
American Zinc, Lead & Smelting Co., Boston, Mass.
Baltimore Copper Smtg. & Rolling Co., New York.
Chadwick-Boston Lead Co., Boston, Mass.
Contes, Bennett & Reidenbach, Inc., Rochester, N. Y.
Goldsmith Bros. Smelting & Refining Co., Chicago, Ill.
United Metals Selling Co., New York.
United Smelting & Aluminum Co., Inc., New Haven, Conn.
United States Smelting, Refining & Mining Co., Inc., New York.

Leather Meal for Dry Tumbling (See also Platers' Supplies).

Lubricants, Graphite.
Dixon, Joseph, Crucible Co., Jersey City, N. J.

Machinery, Pipe Bending.
American Pipe Bending Machine Co., Boston, Mass.

Magnesium Metal.
American Magnesium Corp., Niagara Falls, N. Y.
Leavitt, C. W., Co., New York.
Norton Laboratories, Inc., Lockport, N. Y.
Roessler & Hasslacher Chemical Co., New York.

Magnesium Metal, Sheet, Wire, Ribbon, Powder, Etc.
American Magnesium Corp., Niagara Falls, N. Y.

Magnetic Metal Separators (See also Foundry Suplies).
Dings Magnetic Separator Co., Milwaukee, Wis.
Magnetic Mfg. Co., Milwaukee, Wis.
Paxson, J. W., Co., Philadelphia, Pa.

Manganese, 98-99 Per Cent.
Metal & Thermit Corp., New York.

Manganese Aluminum (10-90 per cent.).
Metal & Thermit Corp., New York.

Manganese Bronze.
Ajax Metal Co., Philadelphia, Pa.
Great Western Smtg. & Ref'g Co., St. Louis, Mo.

Manganese Copper.
Electric Smelting & Alum. Co., Lockport, N. Y.
Lang, R. F., New York.
Metal & Thermit Corp., New York.
Roessler & Hasslacher Chemical Co., New York.

Manganese Metal.
Roessler & Hasslacher Chemical Co., New York.

Metal Briquettes.
Eastern Brass & Ingot Co., Waterbury, Conn.
General Briquetting Co., New York.

Metallic Phosphoro (Phosphor Tin Improved).
New Era Mgf. Co., Kalamazoo, Mich.

Metals (See name of metal wanted).

Metals, Dealers in All Kinds of New (See also name of metal wanted).
Metal Export Co. of America, New York.
Nassau Smtg. & Rfg. Works, New York.
North Atlantic Metal Corporation, New York.
Richards & Co. Boston, Mass.
Seligman, Arthur, New York.
Trotter, Nathan, & Co., Philadelphia, Pa.
Wenger & Co., Paul, New York.

Metals, Dealers in Old.
Capper, Pass, & Son, Ltd., Bristol, England.
Herscopf & Son, Ch., Brooklyn, N. Y.
Lehman Bros., Hoboken, N. J.
Lowenthal Co., The, Chicago, Ill.
Metal Export Co. of America, New York.
Moers, E. M., Sons, New York.
Radnai, Josef, New York.
Weil, Louis, New York.

Metals, Dealers in Old—Gold, Silver, Platinum.
Handy & Harman, New York.
Ney, The J. M., Company, Hartford, Conn.

Metal Goods Made to Order.
Bossert Corporation, Utica, N. Y.
Scovill Manufacturing Co., Waterbury, Conn.

Metals, Plated Sheet.
American Nickeloid Co., Peru, Ill.
Apollo Metal Works, La Salle, Ill.
National Sheet Metal Co., Peru, Ill.

Metal Silver.
Silvel Metal Manufacturing Co., New York.

Metal, Silver Plated Sheet.
Benson, H. K. & F. S., Glen Ridge, N. J.

Metals, Rare.
Radnai, Josef, New York.

Metal Reclaiming Plants.
James Ore Concentrator Co., Newark, N. J.

Metal Refiners—White Metal.
Capper, Pass & Son, Ltd., Bristol, England.

Metals (Carbon Free).
Metal & Thermit Corp., New York.

Metal Turnings, Drosses, Residues, Etc., Buyers of.
Balbach Smelting & Refinery Co., Newark, N. J.
Capper, Pass & Son, Ltd., Bristol, England.
Great Western Smtg. & Ref'g Co., St. Louis, Mo.
Herscopf & Son, Ch., Brooklyn, N. Y.
Lake Erie Smelting & Refining Co., Cleveland, O.
Lehman Bros., Hoboken, N. J.
Lowenthal, Co., The, Chicago, Ill.
Nassau Smtg. & Rfg. Works, New York.
Radnai, Josef, New York.
Weil, Louis, New York.
Whipple & Choate, Bridgeport, Conn.
White & Bro., Inc., Philadelphia, Pa.

Mineral Cleaner.
Electric Smelting & Alum'n Co., Lockport, N. Y.

Mixers for Gold and Silver Sweepings.
Moussette Co., O. J., Inc., Brooklyn, N. Y.

Modeling and Chasing (See Chasing and Modeling).
Union Smelting & Refining Co., Inc., Newark, N. J.

Mold Dryers, Portable (See also Foundry Supplies).
Monarch Engineering & Mfg. Co., Baltimore, Md.

Molding Machines (See also Foundry Supplies).
B. & B. Mfg. Co., Inc., Indianapolis, Ind.
Turner Machine Co., Philadelphia, Pa.

Molding Sand (See Sand).

Motor—Generators.
General Electric Co., Schenectady, N. Y.

Motors.
General Electric Co., Schenectady, N. Y.

Muntz's Metal—Sheets, Rods, Bolts, Nails Etc.
Taunton-New Bedford Copper Co., New Bedford, Mass.

Nichrome Castings.
Driver-Harris Co., Harrison, N. J.

Nickel (German) Silver Ingots, Castings, Sheets, Wire, Rods, Tubes.
American Brass Co., Waterbury, Conn.
Driver-Harris Co., Harrison, N. J.
Dueber Watch Case Mfg. Co., Canton, O.
Seymour Manufacturing Co., The, Seymour, Conn.
Trumpbour-Whitehead Co., New York.

Nickel, Boronic All-Metal.
American Boron Products Co., Reading, Pa.

Nickel, Nickel Castings, Shot Nickel.
Apothecaries Hall Co., Waterbury, Conn.
Crown Rheostat & Supply Co., Chicago, Ill.
L'Hommedieu, Chas. F. & Sons Co., Chicago, Ill.
Moers, E. M., Sons, New York.
Seymour Mfg. Co., Seymour, Conn.

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Nickel Plating (See Electroplating).

Nickel Platers Supplies.
Crown Rheostat & Supply Co., Chicago, Ill.

Nickel Salts.
Apothecaries Hall Co., Waterbury, Conn.
Bennett-O'Connell Co., Chicago, Ill.
General Platers' Supply Co., New York.
Hanson & Van Winkle Co., Newark, N. J.
Harshaw, Fuller & Goodwin Co., Cleveland, O.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Munning, A. P., & Co., New York and Chicago.
Stevens, Frederic B., Detroit, Mich.
Wiarda & Co., John C., Brooklyn, N. Y.
Woodison, E. J., Co., Detroit, Mich.

Nickel Scrap.
Moers' Sons, E. M., New York.

Nickel Sheets (Pure).
Driver-Harris Co., Harrison, N. J.

"Nonpareil" Insulating Materials.
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

Nut Blanking Machines.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Oil Pumps and Storage Tanks.
Metals Production Equipment Co., New York.
Monarch Engineering & Mfg. Co., Baltimore, Md.

Oils, Tempering and Lubricating.
Apothecaries Hall Co., Waterbury, Conn.

Oven Insulation.
Armstrong Cork & Insulation Co., Pittsburgh, Pa.

Ovens, Enameling, Japanning, Lacquering.
Gehnrich Indirect Heat Oven Co., Inc., Brooklyn, N. Y.

Perforated Metals.
Stimpson Co., Edwin B., Brooklyn, N. Y.

Pewter.
Standard Rollings Mills, Inc., Brooklyn, N. Y.

Phosphor Bronze Ingots, Castings, Etc.
Ajax Metal Co., Philadelphia, Pa.
Birkenstein, S., & Sons, Chicago, Ill.
Damascus Bronze Co., Pittsburgh, Pa.

Phosphor Copper and Phosphor Tin.
Coates, Bennett & Reidenbach, Inc., Rochester, N. Y.
Electric Smelt. & Aluminum Co., Lockport, N. Y.
Lang, R. P., New York.
Roessler & Hasslacher Chemical Co., New York.
Seligman, Arthur, New York.
Syracuse Smelting Works, Brooklyn, N. Y.
Wenger & Co., Paul, New York.

Phosphorizers and Plumbago (See also Crucibles, Etc.)
McCullough-Dalzell Crucible Co., Pittsburgh, Pa.

Phosphorus (See also Foundry Supplies).
General Chemical Co., Philadelphia, Pa.
Van Ommeren Corp., Ph., New York.

Phosphorus Amorphous.
Van Ommeren Corp., Ph., New York.

Pickling Compounds.
Hanson & Van Winkle Co., Newark, N. J.

Pickling Machines, Automatic.
No-Dust Drying Machine Co., Providence, R. I.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Pipe Bending Machines.
American Pipe Bending Machine Co., Boston, Mass.

Plated Sheet Metal (See Metals, Plated Sheet).

Platers', Polishers' and Galvanizers' Equipment and Supplies.
Abbott Ball Co., Hartford, Conn.
Alden Speare's Sons Co., Cambridge, Mass.
Ames Sword Co., Chicopee, Mass.
Anthony, H. M., Co., New York.
Apothecaries Hall Co., Waterbury, Conn.
Astle, H. J., & Co., Providence, R. I.
Barrett, M. L., & Co., Chicago, Ill.
Bennett-O'Connell Co., Chicago, Ill.
Bogue, Chas. J., Electric Co., New York.
Boissier Electric Co., New York.
Burns, E. Reed, Supply Co., Brooklyn, N. Y.
Cleveland Blow Pipe & Mfg. Co., Cleveland, O.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Cooper, Charles, & Co., New York.
Corcoran, A. J., Inc., Jersey City, N. J.
Crown Hardware Mfg. Co., Dayton, Ohio.
Divine Brothers Co., Utica, N. Y.
Eager Electric Co., Watertown, N. Y.
Eastern Felt Co., Winchester, Mass.
Ely, C. Upham, New York.
Ford, J. B., Co., Wyandotte, Mich.
Fuller, W. A., Co., Greensburg, Pa.
Galvanizing Corp. of America, Brooklyn, N. Y.
Gardner Machine Co., Beloit, Wis.
Gaylord, Charles H., Chicago, Ill.
General Chemical Co., Philadelphia, Pa.
General Platers' Supply Co., New York.
Hanson & Van Winkle Co., Newark, N. J.
Harshaw, Fuller & Goodwin Co., Cleveland, O.
International Chemical Co., Camden, N. J.
Jackson, John J., & Co., Newark, N. J.
Jantz & Leist Co., Cincinnati, O.
Kalamazoo Tank & Silo Co., Kalamazoo, Mich.
Kalbfleisch Corporation, The, New York.
Kirk & Blum Co., Cincinnati, O.
Leiman Bros., New York.
L'Hommedieu, Chas. F., Sons & Co., Chicago, Ill.
Munning, A. P., & Co., New York and Chicago.
National Galv. & Plat. Equip. Corp., New York.
No-Dust Drying Machine Co., Providence, R. I.
Norton Company, Worcester, Mass.
Oakley Chemical Co., New York.
Rhodes, Jas. H. & Co., Chicago, Ill.
Roessler & Hasslacher Chemical Co., New York.
Smith, John P., & Co., New Haven, Conn.
Smith, Richardson Co., Attleboro, Mass.
Solvay Process Co., Syracuse, N. Y.
Stearns, A. T., Lumber Co., Boston, Mass.
Stevens, Frederic B., Detroit, Mich.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.
Van Ommeren Corp., Ph., New York.
Wagner, Alfred T., Detroit, Mich.
Webster & Perks Tool Co., Springfield, Ohio.
Woodison, E. J., Co., Detroit, Mich.

Plating Apparatus, Automatic.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Plating, Barrel Method.
Terrace Electro Plating Co., New York.

Plating Barrels, Mechanical (See also Platers' Supplies).
Boissier Electric Co., New York.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Crown Hardware Mfg. Co., Dayton, Ohio.
Galvanizing Corp. of America, Brooklyn, N. Y.
Hanson & Van Winkle Co., Newark, N. J.
Munning, A. P., & Co., New York and Chicago.
National Galv. & Plat. Equip. Corp., New York.

Plating Job (See Electroplating, Polishing, Etc.)

Platinum.
Handy & Harman, New York.
Roessler & Hasslacher Chemical Co., New York.
U. S. Smelting, Refining & Mining Co., Inc., New York.

Platinum, Sheet, Wire, Solder.
Handy & Harman, New York.
Roessler & Hasslacher Chemical Co., New York.

Platinum Scrap, Buyers of.
Handy & Harman, New York.
Roessler & Hasslacher Chemical Co., New York.

Polishing and Buffing (See also Electro Plating, Etc.)
Enterprise Electro Plating & Mfg. Co., Detroit, Mich.
Hass, Henry, & Son, New York.
Merigold Electro Plating Co., Inc., Newark, N. J.

Polishing and Grinding Engineers.
Divine Brothers Co., Utica, N. Y.
Norton Company, Worcester, Mass.
Webster & Perks Tool Co., Springfield, Ohio.

Polishing, Buffing and Burnishing Machinery and Supplies (See Platers' Supplies).

Polishing, Belts, Endless (See also Platers' Supplies).
Ames Sword Co., Chicopee, Mass.
Divine Brothers Co., Utica, N. Y.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.

Potash (See Platers' Supplies).

Presses, Bench and Foot.
Bliss, E. W., Co., Brooklyn, N. Y.
Consolidated Press Co., Hastings, Mich.
Shuster, The F. B., Co., New Haven, Conn.

Presses, Cabbaging.
Chicago Baling Press Co., Chicago, Ill.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Presses, Coining.
Consolidated Press Co., Hastings, Mich.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Presses, Drop.
Miner & Peck Mfg. Co., New Haven, Conn.

Presses, Drop Lifters for.
Miner & Peck Mfg. Co., New Haven, Conn.

Presses, Hydraulic.
General Briquetting Co., New York.

Presses, Power.
Baird Machine Co., Bridgeport, Conn.
Bliss, E. W., Co., Brooklyn, N. Y.
Consolidated Press Co., Hastings, Mich.
Garrison, A., Foundry Co., Pittsburgh, Pa.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.

Pressure Blowers (See Blowers, also Foundry Supplies).
Monarch Engineering & Mfg. Co., Baltimore, Md.
New Haven Sand Blast Co., New Haven, Conn.

Pressure and Temperature Regulators.
Taylor Instrument Companies, Rochester, N. Y.

Pumice.
Crown Rheostat & Supply Co., Chicago, Ill.
Rhodes, Jas. H., & Co., Chicago, Ill.

Pyroscopes.
Shore Instrument Co., New York.

Pyrometers.
Hois, Herman A., New York.
Taylor Instrument Companies, Rochester, N. Y.

Recording Thermometers.
Taylor Instrument Companies, Rochester, N. Y.

Refiners, Metal (See Smelters and Refiners).

Rheostats (See also Platers' Supplies).
General Electric Co., Schenectady, N. Y.
Munning, A. P., & Co., New York and Chicago.

Riveting Machines.
Shuster, The F. B., Co., New Haven, Conn.

Rolls, Chilled and Sand.
Garrison, A., Fdy. & Machine Co., Pittsburgh, Pa.

Rolls, Jewelers'.
Leiman Bros., New York.

Rolling Mill Machinery.
Continuous Casting Corporation, Garwood, N. J.
Garrison, A., Fdy. & Machine Co., Pittsburgh, Pa.
Torrington Manufacturing Co., Torrington, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Wolffgram, L., Erie, Pa.

Rouge (See also Platers' and Polishers' Supplies).
Munning, A. P., & Co., New York and Chicago.
Rhodes, Jas. H., & Co., Chicago, Ill.

Rust Preventions.
Oakley Chemical Co., New York.

Rust-Proofing.
Enterprise Electro Plating & Mfg. Co., Detroit, Mich.

Sand, for Blasting.
Standard Equipment Co., New Haven, Conn.
U. S. Silica Co., Chicago, Ill.

Sand Blast Accessories and Supplies.
Brown Specialty Machinery Co., Chicago, Ill.
Pangborn Corporation, Hagerstown, Md.

Sand Blast Barrels.
Mott Sand Blast Mfg. Co., New York.
Pangborn Corporation, Hagerstown, Md.

Sand Blast Cabinets.
Pangborn Corporation, Hagerstown, Md.

Sand Blast Cars.
Pangborn Corporation, Hagerstown, Md.

Sand Blast Equipment.
Pangborn Corporation, Hagerstown, Md.

Sand Blast Systems.
New Haven Sand Blast Co., New Haven, Conn.

Sand Blast Machinery and Equipment.
Astle, H. J., & Co., Providence, R. I.
Brown Specialty Machinery Co., Chicago, Ill.
Leiman Bros., New York.
New Haven Sand Blast Co., New Haven, Conn.
Paxson, J. W., Co., Philadelphia, Pa.

Sand Dryers (See also Foundry Supplies).
Pangborn Corporation, Hagerstown, Md.

Sand Sifters and Mixers.
Brown Specialty Machinery Co., Chicago, Ill.
Turner Machine Co., Philadelphia, Pa.
Wadsworth Core Machine & Equip. Co., Akron, O.

Sand, Moulding (See also Foundry Supplies).
Paxson, J. W., Co., Philadelphia, Pa.

Sawdust Drying-Out Boxes (See also Platers' Supplies).
Smith, Richardson Co., Attleboro, Mass.

Scleroscope.
Shore Instrument Co., New York.

Scrap Metals (See Metal Turnings, Drosses, Residues, Etc.)

Screw Machine Products.
Economy Mfg. Co., Chicago, Ill.
Mueller Metals Co., Port Huron, Mich.

Separators, Magnetic (See Magnetic Metal Separators).

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Shears, Power.
Bliss, E. W., Co., Brooklyn, N. Y.

Sheet Metal Straightening & Cutting Machinery.
Bliss, E. W., Co., Brooklyn, N. Y.
Shuster, The F. B., Co., New Haven, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Silica Sand.
U. S. Silica Co., Chicago, Ill.

Silica, Pulverized.
U. S. Silica Co., Chicago, Ill.

Shot, Boronic-Aluminum, Boronic-Copper and Boronic-Nickel (all metal).
American Boron Products Co., Inc., Reading, Pa.

Silicon Copper.
Ajax Metal Co., Philadelphia, Pa.
Electric Smelting & Alum'n Co., Lockport, N. Y.
Lang, R. F., New York.
Roessler & Hasslacher Chemical Co., New York.

Silvel Metal Ingots.
Silvel Metal Manufacturing Co., New York.

Silver, Boronic, All-Metal.
American Boron Products Co., Reading, Pa.

Silver and Gold Castings.
American Bronze Novelty Works, Inc., New York.

Silver Cyanide.
Apothecaries Hall Co., Waterbury, Conn.
Roessler & Hasslacher Chemical Co., New York.

Silver Refiners.
Roessler & Hasslacher Chemical Co., New York.

Silver, Rolled Sterling.
Handy & Harman, New York.
Jackson, John J., & Co., Newark, N. J.

Silver, Solder.
Ney, The J. M., Company, Hartford, Conn.

Silver Trysalyt.
Roessler & Hasslacher Chemical Co., New York.

Smelters of Copper-Bearing Materials.
Capper, Pass & Son, Ltd., Bristol, England.
Great Western Smtg. & Ref'g Co., St. Louis, Mo.
Mueller Metals Co., Port Huron, Mich.
North American Smelting Co., Philadelphia, Pa.
Whipple & Choate, Bridgeport, Conn.
White & Bro., Philadelphia, Pa.

Smelters and Refiners, Gold and Silver.
Goldsmith Bros. Smelting & Refining Co., Chicago, Ill.
Roessler & Hasslacher Chemical Co., New York.

Smelters and Refiners—White Metal.
Capper, Pass & Son, Ltd., Bristol, England.
Columbia Smelting & Refining Works, New York.
Great Western Smtg. & Ref'g Co., St. Louis, Mo.
Michigan Smelting & Refining Co., Detroit, Mich.
United Smelting & Aluminum Co., New Haven, Conn.
Union Smelting & Refining Co., Newark, N. J.

Soap (See also Platers' Supplies).
International Chemical Co., Camden, N. J.

Solder, Aluminum.
Aluminum Company of America, Pittsburgh, Pa.
United Smelting & Aluminum Co., Inc., New Haven, Conn.

Soldering Flux.
Allen, L. B., Co., Inc., Chicago, Ill.
Davis Process Co., Brooklyn, N. Y.
L'Hommedieu, Chas. F., Sons & Co., Chicago, Ill.
Ney, The J. M., Company, Hartford, Conn.

Soldering, Hard and Silver, for the Trade.
Vernier, C. F., New York.

Soldering Irons and Tools.
Allen, L. B., Inc., Chicago, Ill.
Hendricks Bros., New York.
Hussey, C. G., & Co., Pittsburgh, Pa.
Taunton-New Bedford Copper Co., New Bedford, Mass.

Solder Molds.
Schweiner, Chas. K., St. Louis, Mo.

Solder, Silver.
Ney, J. M., & Co., Hartford, Conn.

Solder, Tinners'.
U. S. Reduction Co., E. Chicago, Ind.

Solder and Solder Wire, Tinners'.
United Smelting & Aluminum Co., Inc., New Haven, Conn.

Soluble Cotton.
Dupont Chemical Works, New York.

Spelter.
American Zinc, Lead & Smelting Co., New York.
American Zinc Products Co., Warren, Ohio.
Baltimore Copper Smelt. & Rolling Co., New York.
Eastern Zinc Refining Co., New York.
Hegeler Zinc Co., Danville, Ill.
Illinois Zinc Co., Peru, Ill.
Matthiesen & Hegeler Zinc Co., La Salle, Ill.
New Jersey Zinc Co., The, New York.
U. S. Smelting, Refining & Mining Co., Inc., New York.
United Zinc Smelting Co., New York.

Spelter Solder (See Solder, Brazing).

Spinning Lathes.
Pryibil Machine Co., P., Inc., New York.

Spinning Metals (See also Metal Goods Made to Order).
Kilborn-Sauer Co., Fairfield, Conn.
Standard Rolling Mills, Brooklyn, N. Y.

Sponges.
Rhodes, Jas. H., & Co., Chicago, Ill.

Spraying Machines and Hoods, Tables, Etc., for Lacquer, Japan, Enamel, Etc.
De Vilbiss Mfg. Co., Toledo, O.
Holton, B. E., Co., Los Angeles, Cal.
Ideal Air Brush Co., New York.

Sprue Cutters (See also Foundry Supplies).
Bliss, E. W., Co., Brooklyn, N. Y.
Shuster, The F. B., Co., New Haven, Conn.
Turner Machine Co., Philadelphia, Pa.

Stamping and Drawing, Metal (See also Metal Goods made to order).
Bossert Corporation, Utica, N. Y.
Bridgeport Brass Co., Bridgeport, Conn.
Globe Machine & Stamping Co., Cleveland, O.
Kilborn-Sauer Co., Fairfield, Conn.
Metal Crafters, East Stroudsburg, Pa.
Standard Metal Goods Mfg. Co., New York.

Steel, Boronic All-Metal.
American Boron Products Co., Reading, Pa.

Sterling Silver Sheets.
Handy & Harman, New York.

Stirrers, Graphite (See Crucibles, Etc.).

Stoneware Jars.
Crown Rheostat & Supply Co., Chicago, Ill.

Straightening & Cutting Machinery, Strip Metal & Wire.
Shuster, The F. B., Co., New Haven, Conn.

Straightening, Cutting and Forming Machinery, Sheet Metal.
Bliss, E. W., Co., Brooklyn, N. Y.
Shuster, The F. B., Co., New Haven, Conn.
Torrington Manufacturing Co., Torrington, Conn.

Sulphate of Copper.
Wiarda & Co., John C., Brooklyn, N. Y.

Sulphocyanide of Soda.
Roessler & Hasslacher Chemical Co., New York.

Sulphuret of Potassium (See Platers' Supplies).

"Super-Heat" Fire Brick Cement.
Clinton Metallic Paint Co., Clinton, N. Y.

Sweep Smelters (See Smelters, Sweep).

Switchboards.
General Electric Co., Schenectady, N. Y.

Tank Rheostats.
Connecticut Dynamo & Motor Co., Irvington, N. J.

Tanks.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.

Tanks Electroplaters.
Chadwick-Boston Lead Co., Boston, Mass.
Corcoran, A. J., Inc., Jersey City, N. J.
Crown Rheostat & Supply Co., Chicago, Ill.
Hanson & Van Winkle Co., Newark, N. J.
Kalamazoo Tank & Silo Co., Kalamazoo, Mich.
Stearns, The A. T., Lumber Co., Boston, Mass.

Tanks, Stoneware (See also Platers' Supplies).
General Ceramics Co., New York.

Testing, Laboratories.
Thomson, S. H., Chemical Laboratories, Dayton, O.

Tin, Chloride of
Apothecaries Hall Co., Waterbury, Conn.

Tinning Equipment, Electro-.
National Galvanizing & Plating Equipment Corporation, New York.

Tinning Equipment, Hot.
New Standard Hardware Works, Mt. Joy, Pa.

Tinning, Hot, for the Trade.
Malleable Iron Fittings Co., Branford, Conn.

Tin, Pig, Bar and Block.
Baltimore Copper Smelt. & Rolling Co., New York.
Richards & Co., Boston, Mass.
U. S. Reduction Co., E. Chicago, Ind.
Wenger, Paul, & Co., New York.

Tin Substitute.
New Era Mfg. Co., Kalamazoo, Mich.

Tinsmiths' Solder.
New Era Mfg. Co., Kalamazoo, Mich.

Tobin Bronze.
American Brass Co., Waterbury, Conn.

Tongs, Crucible and Pick-Up.
Paxson, J. W., Co., Philadelphia, Pa.

Tools, Jigs, Fixtures, etc.
Webster & Perks Tool Co., Springfield, Ohio.

Transformers.
General Electric Co., Schenectady, N. Y.

Trisalyt Triple Salts.
Roessler & Hasslacher Chemical Co., New York.

Trolleys, Overhead.
New Jersey Foundry & Machine Co., New York.

Tube Mill Machinery.
Torrington Mfg. Co., Torrington, Conn.

Tubes (See names of metal wanted).

Tubes, Copper Brass and Alloy.
Wheeler Condenser & Engineering Co., Carteret, N. J.

Tumbling Barrels (See also Foundry Supplies and Platers' Supplies).
Baird Machine Co., Bridgeport, Conn.
Globe Machine & Stamping Co., Cleveland, Ohio.
Munning, A. P., & Co., New York and Chicago.
Smith-Richardson Co., Attleboro, Mass.

Tumbling Japans.
Hilo Varnish Corporation, Brooklyn, N. Y.

Type Metal (See White Metal Ingots).

Vacuum Pumps.
Leiman Bros., New York.

Varnishes for all purposes.
Hilo Varnish Corporation, Brooklyn, N. Y.

Ventilators and Apparatus (See Dust Collectors, Etc.).

Vibrators (See also Foundry Supplies and Equipment).
Hausfeld Co., Harrison, Ohio.
Malleable Iron Fittings, Branford, Conn.
Woodison Co., E. J., Detroit, Mich.

Vienna Lime Compositions.
Woodison, E. J., Co., Detroit, Mich.

Voltmeters (See Platers', Polishers' and Galvanizers' Supplies).

Voltmeters & Ammeters.
Connecticut Dynamo & Motor Co., Irvington, N. J.

Whale Oil Soap.
Munning, A. P., & Co., New York and Chicago.

White Enameling.
Metal Crafters, East Stroudsburg, Pa.

White Metal Ingots (See Smelters and Refiners—White Metal).

Wire (See name of metal wanted).

Wire and Cable.
General Electric Co., Schenectady, N. Y.

Wire, Rubber Insulated, Magnet and Waterproof.
Rome Wire Co., Rome, N. Y.
Standard Underground Cable Co., Pittsburgh, Pa.

Wire (Special Nickel Alloys).
Driver-Harris Co., Harrison, N. J.

Wire-Straightening & Cutting Machinery.
Shuster, The F. B., Co., New Haven, Conn.

Wire Straightening and Forming Machinery.
Baird Machine Co., Bridgeport, Conn.

Wire Wheel and Hand Brushes (See also Foundry Supplies).
Blumenthal, H., & Co., New York.
Brooklyn Scratch Brush Co., Brooklyn, N. Y.
Hanson & Van Winkle Co., Newark, N. J.

Wiring Devices.
General Electric Co., Schenectady, N. Y.

Woodfillers, Paste.
Hilo Varnish Corporation, Brooklyn, N. Y.

Wyandotte Metal Cleaner.
Ford, J. B., Co., Wyandotte, Mich.

Zinc.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.

Zinc, Cold Rolled, in Coil.
Platt Bros. Co., Waterbury, Conn.

Zinc Cyanide.
Roessler & Hasslacher Chemical Co., New York.

Zinc, Dust (See also Platers' Supplies).
Hanson & Van Winkle Co., Newark, N. J.
L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
New Jersey Zinc Co., New York.
Roessler & Hasslacher Chemical Co., New York.
U. S. Smelting, Refining & Mining Co., Inc., New York.

Zinc Salts, Commercial (See also Platers' Supplies).
Crown Rheostat & Supply Co., Chicago, Ill.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Zinc, Sheets, Plates, Rods, Etc.
American Nickeloid Co., Peru, Ill.
Apollo Metal Works, La Salle, Ill.
Illinois Zinc Co., Peru, Ill.
Matthiesen & Hegeler Zinc Co., La Salle, Ill.
National Sheet Metal Co., Peru, Ill.
Platt Bros. & Co., Waterbury, Conn.

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